THE IRON TRADE REVIEW

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CHEERING NEWS

COMES FROM NEARLY ALL IRON CENTERS,

But Prospects May be Spoiled by Sudden Advances in Prices—Radical Reduction in Wire Products.

Favorable developments are plentiful in nearly all branches of the iron trade. Very heavy sales of finished material have been made, and slight advances in quotations have not retarded the buying. There is, however, some question as to the extent to which buying has been justified by actual consumptive demands, as it is clear that heavy tonnages have gone to stocks. There is danger that prices may be too rapidly advanced and cause extreme dullness during the summer months.

Iron Ore Prices

Owing to the improvement in pig iron and finished materials, it is not now probable that ore prices will be reduced. If they should be, a reduction in the wages of miners would be inevitable. Although the Lake Seamen and affiliated unions declared a strike May 1, on account of the open shop policy announced by vessel owners, there are now more boats in commission on the lakes than are demanded by the ore carrying trade. The ability of the unions to get men to leave their posts will be tested in a few days, as vessels arrive from upper lake ports.

Pig Iron Conditions

The buying of pig iron has continued actively in eastern territory. Moderate tonnages have been purchased in Chicago and St. Louis, and prices are hardening in most places, although the Pittsburg district is an exception. Some southern iron can still be obtained for prompt shipment at $11, but $11.50 is the lowest quotation for future delivery. In the Cincinnati district, there is still considerable iron on contracts which the consumers are not taking.

Wire Products

The aggressive policy of independent manufacturers of wire products in taking orders at lower prices than those of the leading interest has resulted in the latter adopting radical action in reducing prices from $7 to $10 per ton, but the reduced prices will not apply on contracts, and it is anticipated that an advance will soon be announced. The April business of the American Steel & Wire Co. was extremely heavy. One large independent interest states that its April business on crude steel was the heaviest in the history of the company.

Steel Bars

The business taken by the steel bar manufacturers has made a most favorable showing, and the lowest price now being named is 1.15c Pittsburg. No contracts beyond the end of the present year have been made at that price, and the advisability of advancing the prices of bars, plates and structural material at an early date is being considered by important interests.

Structural Material

Orders for heavy tonnages of structural material have been placed in New York, Chicago and other cities, and fabricating prices have been advanced from $2 to $3 per ton. A fair amount of buying is being done by the railroads for bridge construction. The only important rail transaction reported is the purchase of 65,000 tons by the St. Paul. Impovement for light rails is marked, and the leading manufacturers have advanced their quotations.

Tubular Goods

The leading interest was the lowest bidder on 8,000 tons of cast iron pipe for the city of Boston, and the Standard Cast Iron Pipe Co. on 3,000 tons. Sales of merchant pipe last month were very heavy, two independent interests having done the largest business in their history. Iron pipe prices may be advanced June 1.

Pig Iron Production

The production of the blast furnaces of the country for April amounted to 1,733,653 tons, compared with 1,822,024 tons in March. The daily production for April was 57,788 tons, and for March 58,775 tons. There were five more furnaces in blast March 31 than on April 30.

LATE PITTSBURG NEWS.

(Special Telegram.)

Pittsburg, May 5.—The Western Bar Iron Association, in conference with the Amalgamated Association of Iron, Steel and Tin Workers, Detroit, Saturday, asked for a 10 per cent reduction in the annual iron boiling and finishing scale, which will go into effect July 1.

The American Rolling Mill Co., Middletown, O., has closed for 8,000 tons of basic for the last half, to be equally divided between Columbus and Toledo furnaces, at $14.25 and $14.35 furnace. respectively. This figures back to $13.70 and $13.90 valley, at which figures it was offered to other interests, but refused.

A locomotive company is in the market for from 7,000 to 8,000 tons of No. 2 for prompt shipment.

The Republic Iron & Steel Co. has started the Hall furnace at New Castle, and the Carnegie Steel Co. is preparing to put in blast its No. 2 stack at South Sharon.

Car service reports for March in and about Pittsburg show an increase of 38,625 cars handled over those of a year ago. For the first quarter, there was a gain of 127,761 cars, compared with the same period last year.

PITTSBURG.

General Conditions Improved—Pig Iron Prices Still Low.

Office of THE IRON TRADE REVIEW,
510 Park Bldg., May 4.

The months of March and April, as gaged by the tonnage of finished materials entered by the mills, have presented indications of recurring activity in the iron and steel industry. Following the adjustment to the new conditions imposed by the declaration of the open market, consumers began buying more freely and have continued and increased this movement up to the present time, until it has reached very satisfactory proportions. The informal action of some makers recently in drawing away from the minimum of shaded quotations has tended to increase the general strength of the situation through other companies taking similar steps and to stimulate buying interest among those users who had confidently anticipated lower prices.

April specifications in finished lines were substantially enlarged over March. Heavy tonnage records were made by the mills in merchant pipe and steel bars, some companies having reached the highest mark of their history in the volume of actual rolling orders taken during a single month. Equally substantial results were attained by certain makers in their shipments of semi-finished steel, which favorably reflected the greater consumption of manufacturing patrons. Well-filled order books in light rails led the leading manufacturers to advance their asking quotations during the past week.

The sharp cut in wire products, ranging from $7 to $10 a ton over former official prices, and made effective May 1, brought with it some surprise by reason of its magnitude, although a considerable reduction had been expected by jobbers and consumers as soon as the spring trade had been lined up. Cause for the radical action taken is laid to the aggressiveness of independent interests in shading the official quotations which have been maintained by the leading producer during the past several months. The break in the wire market leaves rails as the only finished material which has not been reduced, since the abandonment of official schedules in February.

Low prices are still ruling in pig iron, despite the greater buying activity, and the stocks in furnace yards are apparently having a depressing effect upon the market.

Pig Iron.—Although there is greater activity in contracting for future delivery, the pig iron market is not responding with any positive price strengthening and forward material is being engaged at low figures. Beyond sentimental improvement, conditions are unchanged. There continues a good inquiry, but this does not appear as promising or of as great a total volume as several weeks ago. Some grades are selling at new low marks in this movement, particularly Bessemer.

The largest sale of the week in this territory was to a local foundry interest, which closed for 2,000 tons of various grades of foundry on a basis of $14 valley for No. 2, 500 tons of standard Bessemer at $14 50 valley and 500 tons of standard low phosphorus at about $20 delivered. All this iron is for last half delivery. Some melters have been quietly closing on their extended requirements, paying $13.50 for gray forge and about $14 valley for malleable. Inquiries now out from the Pittsburg district include 500 tons of prompt Bessemer for a steel company, 1,000 tons of No. 2 by a sanitary manufacturing company and one round lot of basic for extended shipment.

Foundry iron from furnaces closer to Pittsburg than the valleys is available at $14.75 delivered, for No. 2. Iron analyzing up to 1.75 per cent silicon has been offered at $13.75 valley. Although reports of shading of this price by a few cents, are heard, basic is fairly steady at $14 valley. It is also reported that Bessemer at $14.50 valley may be shaded slightly.

The Bessemer average for April was $14.90 valley or $15.80 Pittsburg compared with $15.44 valley or $16.34 Pittsburg in March. The basic average for April was $14.15 valley or $15.05 Pittsburg against $14.94 valley, or $15.84 Pittsburg.

On prompt and second quarter delivery on northern iron, we quote as follows:

Bessemer, valley	$14.50 to 14.75
Bessemer, Pittsburg	15.40 to 15.65
No. 2 foundry, Pittsburg	14.75 to 14.90
Gray forge, Pittsburg	14.40 to 14.65
Basic, valley	14.00 to 14.25
Basic, Pittsburg	14.90 to 15.15

Ferro-Alloys.—The market in 50 per cent ferro-silicon has gained considerable strength during the past week, and the previous low prompt prices have been elevated. Curtailed domestic production at Niagara Falls is given as a cause for the stronger tone, as well as the proposed increase of duty on the foreign material. We note a sale of 100 tons for May and June at $60.80 Pittsburg. Some sellers are quoting higher prices. There is little demand for ferro-manganese. We quote 80 per cent ferro-manganese at $41 to $42 seaboard with a freight rate of $1.95 to Pittsburg.

Fifty per cent ferro-silicon is quoted at $60 to $61 Pittsburg on forward deliveries; domestic, 12 per cent, $26; 11 per cent, $25; 10 per cent, $24, Pittsburg.

Plates.—The mills are entering a very favorable tonnage of plates and an improvement in operations is being shown. Specifications for the material for steel cars which have recently been contracted for and are now being built, are coming in quite liberally and the structural activity throughout the country is furnishing a steady volume of orders. The Carnegie Steel Co. has booked 2,000 tons for an ocean vessel being built for the Union Sulphur Co. by the Fore River Ship Building Co., Quincy, Mass. Plate prices are firmer and makers are not so aggressive to take low priced business. We quote the present market as follows:

Tank plate, ¼-inch thick, 6¼ to 100 inches, 1.30c f. o. b. mill. Extras are as follows per 100 pounds: Boiler and flange steel plate, 0.10c; A. B. M. A. and ordinary firebox steel plates, 0.20c; still bottom steel, 0.30c; marine steel, 0.40c; locomotive firebox steel, 0.50c; all sketches, excepting straight taper plates varying not more than 4 inches in width at ends, narrowest end not being less than 30 inches, 0.10c; circles, 0.20c. Plates in widths over 100 inches up to 115 inches, 0.05c; over 110 inches up to 115 inches, 0.10c; over 115 inches up to 120 inches, 0.15c; over 120 inches up to 125 inches, 0.25c; over 125 inches up to 130 inches, 0.50c; over 130 inches, 1c. Gages under ½-inch to and including 3/16-inch plate on thin edges, 0.10c; under 3/16 to and including No. 9, 0.25c. Five cents extra for less than carloads. Terms, net cash in 30 days.

Sheets.—While shading in sheet prices is still current, there are indications of a better sentiment among makers and the inclination of the market appears to be toward greater firmness. Consumers are showing more willingness to contract ahead, and the manufacturers, having booked considerable tonnage, are generally not satisfied to accept present prices to the end of the year. Some makers have set July 1 as the date beyond which the minimum quotations now in force do not apply. There are instances to be noted where jobbers are taking on heavier stocks than for more than a year, but as a rule little material is in store. The American Sheet & Tin Plate Co. this week put on its Piqua, O., plant, an accident at the Vander-

grift works having temporarily disabled five mills. The Guernsey plant of 11 mills at Cambridge, O., will be started either this or next week. We quote present minimum prices which are subject to some shading, as follows:

Blue annealed sheets, Nos. 10 and heavier, 1.60c; Nos. 11 and 12, 1.65c; Nos. 13 and 14, 1.70c; Nos. 15 and 16, 1.80c; box annealed sheets, Nos. 10 to 12, 1.85c; Nos. 13 and 14, 1.90c; Nos. 15 and 16, 1.95c; Nos. 17 to 21, 2c; Nos. 22 to 24, 2.05c; Nos. 25 and 26, 2.10c; No. 27, 2.15c; No. 28, 2.20c; No. 29, 2.25c; No. 30, 2.35c; galvanized sheets, Nos. 13 and 14, 2.30c; Nos. 15 and 16, 2.40c; Nos. 17 to 21, 2.50c; Nos. 22 to 24, 2.65c; Nos. 25 and 26, 2.85c; No. 27, 3.05c; No. 28, 3.25c; No. 29, 3.35c; No. 30, 3.60c; painted roofing sheets, $1.55 per square for No. 28 gage, 2½-inch corrugation, and galvanized roofing sheets, $2.80 per square for No. 28 gage, 2½-inch corrugation.

Tin Plate.—Specifications for tin plate are coming to the mills very freely, principally from the can makers who are preparing for the season's fruit and vegetable crop. Contracts at present prices are being booked covering the requirements of this trade up to the end of the canning season, about Oct. 1. The fish packing activity is not so great, and this business is expected to be well out of the way in another month. The leading interest continues to operate all its serviceable capacity with the exception of its Demmler plant, while the independents are running at 85 per cent and better of capacity. We quote present prices, which are quite firm, as follows:

Coke tin plate, 100-pound basis, 14 x 20, $3.45 f. o. b. mill Pittsburg district and $3.40 in large lots. Terms, 30 days, less 2 per cent for cash in 10 days.

Rails and Track Material.—The prominent manufacturers of light rails from new steel have withdrawn their former prices and are quoting advances of from $2 to $3 a ton. The asking price on 25 to 45-pound sections is about $25 a ton where $22 to $23 had previously prevailed. Makers have been obtaining a substantial run of business and exhibiting a stronger sentiment in accepting orders. In standard sections, the local maker is booking some small tonnages and is receiving regular specifications against contracts. The rail mills at the Edgar Thomson works are running at about the same gait of several months past. The demand for track fastenings is good. Spike prices are subject to considerable irregularity. On present specifications on Bessemer rails, we quote as follows, the base price for open-hearth rails being $30 mill:

Fifty-pound and heavier, 500-ton lots and over, $28; carloads and less than 500 tons, $30; less than carload lots, $32; 8-pound, $32; 12-pound, $28; 16 to 45 pound, $25 to $26; angle splice bars for standard sections, 1.50c. Standard spikes, 1.60c to 1.70c Pittsburg; hand spikes, 1.60c to 1.70c Pittsburg.

Steel.—A heavy tonnage of semi-finished steel is being shipped by the mills on long-term contracts, as the general consumption of this material has considerably increased. Some companies are attaining records in the amount of raw material delivered to their patrons. Full market prices are being received on contracts, as sliding scale arrangements usually net a figure equal to or better than the prevailing level. Some indpendents have been offering steel at concessions, largely on prompt material, but the market is now less subject to these disturbances. The Carnegie Steel Co. is now regularly rolling a very large tonnage of sheet bars, most of which is being consumed by the American Sheet & Tin Plate Co.

Bessemer and open-hearth 4 x 4 billets with 0.25 carbon and less are quoted at $23 Pittsburg, with the usual extras for size and analysis, and forging billets at $25 Pittsburg. Sheet and tin bars are $25 Pittsburg. Some steel makers are still willing to divide the freight within the $1 limit, making the price in the immediate Pittsburg territory $23.50 delivered on billets and $25.50 delivered on sheet bars.

Hoops and Bands.—An improvement in price conditions in the hoop market is to be noted, and the level of going business appears to be about 1.50c mill. Cases of lower than this quotation being done are exceptional. There is a better volume of orders. We quote the present markets as follows:

Hoops in carload lots, 1.50c to 1.60c; in less than carload lots, 1.60c to 1.70c; bands, 1.15c to 1.20c, base half extras as per standard steel.

Merchant Bars.—Makers of steel bars are now acting well in unison and are holding their base minimum prices at 1.15c Pittsburg. The 1.10c price, which had disturbed the market for the past several weeks, disappeared the latter part of last week after it was apparent that the 1.15c quotation was being strictly observed by some of the leading makers. The greater firmness among the mills has had a favorable effect upon buying, and consumers who 10 days ago were reluctant to contract because of an expectation of lower prices, are now showing a willingness to close for their requirements for an extended period. Specifications have also been stimulated, and the heaviest tonnage in mill orders received in several years has been taken by the some of the principal interests. The jobbing mills of the Carnegie Steel Co. are making the best record for operations of any of the capacity of that company, and this is regarded as a pleasing index to the consumptive power of diversified lines of manufacture. The reinforcing bar trade is very good. Bar iron is showing a greater activity than for a number of weeks, but prices are unchanged. We quote current prices as follows:

Common iron bars, 1.30c to 1.35c Pittsburg; Bessemer and open-hearth steel bars, 1.15c; plow and cultivator, 1.15c; channels, angles, zees, tees, under 3-inch, 1.25c, all f. o. b. mill. The following differentials are maintained on steel: Less than 2,000 pounds, 0.10c advance; less than 1,000 pounds of a size, 0.30c advance. Cold rolled and ground shafting, 60 per cent in carloads, and 55 per cent in less than carloads, delivered in base territory, but these discounts are being shaded. Planished and machine straightened tire steel is 1.40c base; iron finished tire under 1½ by 1½ inches, 1.35c, both plus ½ extra on tire card; iron finished tire, 1½ by ½ and over, 1.20c, plus ½ extra on the steel bar card.

On cold rolled strip steel, width 1½ inches and wider, and 0.100 inch and thicker, we quite base prices for 100 pounds, $3.05 on hard, and $3.30 on soft.

Structural Material.—Firmness in structural steel prices is more apparent, and reports of low quotations on plain material are becoming exceptional. The 1.25c level better represents the general market, and the companies which have been disposed to undersell this figure are elevating their minimum quotations. No improvement, however, is shown in the condition of low fabricated prices, which have prevailed for some time. Considerable tonnage is now being rolled and fabricated on contracts already placed, and the Ambridge plant of the American Bridge Co. is running at about 60 per cent of capacity. Current inquiry is only fair. A number of the railroads having closed for their extended requirements, the demand from this source is not heavy. The American Bridge Co. has taken

800 tons for the new Wilkinsburg high school and the 4,000 tons for the new plant of the Inter Ocean Steel Co. have been placed with a Chicago interest. W. N. Kratzer & Co. have taken 600 tons for the Temple theater at Rochester, N. Y. Bids have gone in for the new West Penn hospital in this city, about 1,200 tons, but the steel has not been awarded. A county bridge at New Castle, 500 tons, will close May 12, and one at Franklin, Pa., about 250 tons, on May 29. Contracts for the new Pittsburg Athletic Association building will be placed soon and it is expected that the steel, 1,400 tons, will go to the Cambria Steel Co. We quote the present market on structural shapes as follows:

Beams and channels, 15-inch and under, 1.20c to 1.30c; over 15 inches, 1.30c to 1.40c; zees, 1.20c to 1.30c; tees, 1.25c to 1.35c; angles, from 3 to 6 inches, 1.20c to 1.30c; over 6 inches, 1.30c to 1.40c; universal and sheared plates, 6¼ inches wide and wider, 1.20c to 1.30c.

Merchant Pipe.—A high water mark in the aggregate orders entered principally in merchant pipe during the month of April was reached by a number of the leading makers of tubular goods. With some companies, the business taken was the largest of any monthly total in their histories. The heavy demand for merchant pipe reflects in a promising way the current consumption in the country, as little of the moving material is going into stocks. This condition of well filled order books has given the market a distinctly stronger tone and there are some expressions of belief that an advance of prices within the next 60 days would not be surprising. Iron pipe quotations have been especially low and the regular discounts have been shaded usually by one point. There is a good demand for oil and gas field goods. Many large line projects are under advisement, one of the latest to be launched being a gas line from the Illinois gas fields to St. Louis, a distance of 52 miles. We quote the following official discounts on merchant pipe subject to five off to jobbers, while a few of the very large jobbers with mill connections are given an additional one point off:

	—Steel—		—Iron—	
	Black.	Galv.	Black.	Galv.
⅛ and ¼ inch.....	72	56	69	..
⅜ inch	73	59	70	56
½ inch	76	64	73	61
¾ to 6 inch.....	80	70	77	67
7 to 12 inch.....	75	60	72	57
PLUGGED AND REAMED.				
1 to 4 inch.....	78	68	75	65
EXTRA STRONG PLAIN ENDS.				
⅛ to ⅜ inch.....	65	53	62	50
½ to 4 inch.....	72	60	59	57
4½ to 8 inch.....	68	56	65	53
DOUBLE EXTRA STRONG PLAIN ENDS.				
½ to 8 inch.....	61	50	58	47

Boiler Tubes.—Some of the makers of iron tubes are enjoying a good trade, but the condition of the general market is one of continued quietness. Locomotive building is light and the demands of the merchant users are only moderate. There is some shading of tube prices. We quote the following official discounts on lap-welded steel boiler tubes to jobbers in carloads:

1 to 1½ inch	50
1¾ to 2¼ inch	62
2½ inch	64
2¾ to 5 inch	70
6 to 13 inch	62

2½ inch and smaller, over 18 feet, 10 per cent net extra.

2¾ inch and larger, over 22 feet, 10 per cent net extra.

To destinations east of the Mississippi river will be sold at delivered discount for carloads lowered by two points, for lengths 22 feet and under; longer lengths, f. o. b. Pittsburg.

We quote the following official discounts on charcoal iron tubes to jobbers:

1 to 1½ inch.....	45
1¾ to 2¼ inch.....	45
2½ inch	50
2¾ to 5 inch	57
6 to 13 inch	45

Wire Products.—The American Steel & Wire Co. has announced an official reduction of from $7 to $10 a ton in all wire products, which became effective May 1. The cut officially amounts to $7 a ton in nails, $8 in plain wire and $10 in painted and galvanized barb wire, but the actual reduction is $2 less, as shading to this extent has been done by independent interests almost from the beginning of the open market in February. It is announced that the reduced quotations will not apply to contracts and will only be accepted on business which will be promptly specified. No speculative orders will be taken. The independent interests have lowered their quotations to the new level, but the general expectation among makers and some of the trade is that the new prices will not be long lived. The American Steel & Wire Co. has been maintaining the former official prices in the interest of the jobbers until the spring buying movement was well under way. A heavy volume of business has been booked by all the makers, principally for early shipment. We have revised our prices and quote as follows:

Wire nails, jobbers' carload lots, $1.60; retailers' carload lots, $1.65; painted barb wire, jobbers' carload lots, $1.60; retailers' carload lots, $1.65, with 30c for galvanizing; plain wire to jobbers in carloads, $1.40, and to retailers in carloads, $1.45; polished staples, $1.60; galvanized staples, $1.90.

Wire Rods.—While no formal action has been taken on wire rod prices in connection with the reduction in wire products, some step along this line is expected soon. We quote the present nominal market at $29 Pittsburg on Bessemer and $30 Pittsburg on open-hearth rods.

Coke.—Negotiations are being carried on by a number of furnace companies for their last half requirements and some contracting is being done usually at bargain prices. A Cleveland furnace has out an inquiry for 13,000 to 15,000 tons monthly for the last half. Some spot furnace coke is being sold. There is also some foundry coke buying for delivery after July at quoted prices. While the sentiment in the coke market seems improved, price conditions have not strengthened. We quote spot furnace coke at from $1.50 to $1.75 ovens and on contract from $1.60 to $1.85 ovens according to grade. On first class Connellsville foundry coke, the range is from $1.80 to $2 ovens for prompt shipment and on contract from $1.90 to $2.25 ovens. The *Courier's* figures for the week ending April 24 show 21,804 ovens active and an output of 230,229 tons, compared with 22,108 active ovens and a production of 233,151 tons the previous week.

Old Material.—Dealers in old material are sharing in the greater confidence that is infusing the iron and steel market and are holding their stocks for higher prices. Consumers are not willing to pay more for their material or to buy heavily for the future while finished products remain at their present level. Supply and demand appear well balanced, as current production is filling passing needs, although the market appears to be gaining strength. Some grades are commanding higher figures. We quote gross tons delivered in the Pittsburg district as follows:

Heavy melting scrap, $14 to $14.50; re-rolling rails, $14.25 to $14.50; bundled sheet scrap, $11.25 to $11.75; iron axles, $18 to $19; old iron rails, $15 to $16; No. 1 wrought scrap, $13.25 to $13.75; old car wheels, $14.25 to $14.75; low phosphorus, $16.50 to $17; machine shop turnings, $8 to $8.50; cast borings, $7 to $7.50; No. 1 cast scrap, $13.50 to $14; malleable, $13 to $13.50; stove plate, $10.50 to $11.

The Vulcan Detinning Co. on May 1 removed its New York offices from 157 Cedar street to the Engineering building, 144 Liberty street.

CHICAGO.

Improvement Shown in Nearly All Products—Radical Cut in Wire.

Office of THE IRON TRADE REVIEW,
1328 Monadnock Block, May 4.

In the general market of finished steel products, there is a distinct atmosphere of better things. Substantial improvement based on tonnages specified and under contract is shown in many directions. Particularly is it true of shapes and plates. The Illinois Steel Co. is reported as operating up to 95 per cent of capacity. Contracting for steel bars for the remainder of this year is in progress and the tonnage, which will undoubtedly be engaged before the conclusion of the movement, will secure the operations of the mills for several months to come. In these products prices show a distinct gain in firmness. The disturbance of the market with respect to wire products brought out a new scale of prices, showing a reduction of $7 a ton. This takes effect this week. Wire rods were reduced about $6 a ton. The only important rail business in the west was the St. Paul order for a maximum of 65,000 tons to be rolled by the Illinois Steel Co. The pig iron market was moderately active, the principal event of the week being the purchases by the Oliver Plow Co., of South Bend. Such weakness as is to be found in the market has to do with northern rather than southern iron at present, and $16.40 delivered is the ruling Chicago price for northern brands. The southern furnaces have taken a firm position on the basis of $11.50 for the last half as the best price. The scrap market shows materially higher prices.

Pig Iron.—The sales of pig iron during the week show a moderate activity with interest generally concerned with small lots. Sales of 1,000 tons and 750 tons are reported, however, and the Oliver Plow Co. bought the major portion of an aggregate inquiry for between 5,000 and 6,000 tons of various grades of iron. It is understood that the price paid on a low grade iron to take the place of scrap was $15 delivered. The purchase also included 2,000 tons of standard Bessemer. On iron for delivery through the third quarter, $11.50 has been the ruling price for Birmingham irons. The same price could probably be obtained through the last half, but sales for the fourth quarter are reported at $12. The northern situation is less firmly established and it is not likely that any business could be placed at better than $16.40 delivered on No. 2 iron. We quote as follows:

Lake Superior charcoal	$19.50 to 20.00
Northern foundry No. 1	17.00 to 17.50
Northern foundry No. 2	16.40 to 16.85
Northern foundry No. 3	16.00 to 16.50
Southern foundry No. 1	16.35 to 16.85
Southern foundry No. 2	15.85 to 16.35
Southern foundry No. 3	15.35 to 15.85
Southern foundry No. 4	14.85 to 15.35
Southern No. 1 soft	16.35 to 16.85
Southern No. 2 soft	15.85 to 16.35
Southern gray forge	13.85 to 14.35
Southern mottled	13.60 to 14.10
Southern silveries, 4 per cent silicon	17.60 to 18.10
Southern silveries, 5 per cent silicon	18.10 to 18.60
Southern silveries, 6 per cent silicon	18.60 to 19.10
Jackson Co. silveries, 6 per cent.	19.40 to 19.90
Jackson Co. silveries, 8 per cent.	20.40 to 20.90
Jackson Co. silveries, 10 per cent	21.40 to 21.90
Malleable Bessemer	16.40 to 16.85
Standard Bessemer	17.00 to 17.50
Alabama basic	16.35 to 16.85

Billets.—The demand for billets during the week was light. An inquiry for 500 tons from a local consumer brought out evidence of firmness in prices at present levels. This may be taken as a natural reflection of the generally improved condition of the market. We continue to quote on the basis of $21 Pittsburg as follows: For 4 x 4 rolling billets, $24, and for forging billets, $26, Chicago base.

Merchant Bars.—Contracting for steel bar requirements through the period ending Jan. 1 has been an active feature of the week. A considerable tonnage has been placed on the basis of 1.15c Pittsburg, which is the ruling price. On spot specifications better than this was done last week, and in all probability could still be obtained, although the conclusion of the present season of contracting will doubtless find the mills in a more conservative mood. Bar iron exhibits a firmer aspect and prices have advanced in the neighborhood of 50 cents a ton, so that 1.25c Chicago now represents the general market level. The mill operations are steadily increasing and although tonnage has been obtained at a sacrifice of profits, the order books are well filled. We quote as follows:

Bar iron, 1.25c; soft steel bars and bands, 1.33c to 1.35c, half extras; soft steel angles, less than 3 x 3, 1.48c; hoops, 1.78c base, full extras, planished or smooth finished tire steel, 1.58c; iron finish, up to 1½ x ½-inch, 1.53c base tire card; iron finish, 1½ x ½-inch and larger, 1.38c base steel card; channel for solid rubber tire, ¾ to 1 inch, 1.88c, and 1⅛-inch and larger, 1.78c; smooth-finished machinery steel, 1.63c; flat sleigh shoe, 1.43c; concave and convex sleigh shoe, 1.63c; cutter shoe, 2.75c; toe calk steel, 1.93c; railway spring, 1.73c, base steel card; vehicle spring steel, 1.78c, base vericle card; crucible tool steel, 7c to 9c, with higher prices asked on special grades. Quotations on shafting are 60 per cent off the list for carload lots, and 55 per cent off for less than carload lots, carload freight allowed to points in base territory. On iron and steel bars from local stocks, we quote as follows: Bar iron, 1.70c to 1.80c, full extras; soft steel bars, 1.50c per 100 pounds base, plus half extras; soft steel hoops, 2.10c, full extras.

Plates.—Prices on plates are undeniably firmer and the strength of the situation is based on tonnage taken. The jobbers who have been carrying small stocks are beginning to look upon the present as the opportune time for adding to their holdings to take advantage of rising prices, which seem at hand. The mills have grown correspondingly conservative in assuming contracts both as to quantity and delivery. There has been in the last few weeks a very good demand for plates for structural purposes and there has also been some increase of tank work requirements. As a result, 1.45c Chicago is close to the bottom price of the leading mills and sales are being more closely limited to July 1 delivery. On spot specifications or specific orders only can the best prices be obtained. At Chicago 1.40c undoubtedly marks the low point. For mill prices see Pittsburg report. Freight to Chicago, 18 cents. We quote for shipment from local stocks as follows:

Tank steel, ¼-inch and heavier, up to 72 inches wide, 1.60c to 1.70c; from 72 inches wide to 96 inches wide, 1.70c to 1.80c; 3/16-inch up to and including 60 inches wide, 1.70c to 1.75c; 72 inches wide, 1.95c to 2c; No. 8 up to 60 inches wide, 1.70c to 1.75c. Flange and head quality, 25c extra.

Sheets.—Store sales continue to show softness in the prices of sheets, although the movement is fairly good. The limited mill capacity in operation in this immediate market adds strength to the situation in a measure and a firmer tone will probably result in sympathy with the rest of the market. For mill prices, see Pittsburg report. Freight to Chicago, 18 cents. We quote store prices at Chicago as follows:

No. 10, 2c to 2.10c; No. 12, 2.05c to 2.15c; No. 14, 2.10c to 2.20c; No. 16, 2.20c to 2.30c; Nos. 18-20, 2.50c to 2.55c; Nos. 22-24, 2.55c to 2.60c; No. 26, 2.60c to 2.65c; No. 27, 2.65c to 2.70c; No. 28, 2.75c to 2.80c; No. 30, 3.05c; galvanized sheets, Nos. 10 to 16, 3c to 3.10c; Nos. 18 to 20, 3.05c to 3.15c; Nos. 22 to 24, 3.20c to 3.25c; No. 26, 3.40c to 3.45c; No. 27, 3.60c to 3.65c; No. 28, 3.80c to 3.90c; No. 30, 4.20c to 4.50c.

Structural Steel.—The tonnage of structural shapes for which contracts have been placed with the mills has been very heavy. An increased proportion of this has come from the railroads, in addition to which there is a

well distributed demand for building steel. Projects are brought to the closing point much more quickly than has been true for many months, all of which is evidence of a real improvement in the strength of the situation. The following prospects are reported: An inquiry for 400 tons for the Chicago, Milwaukee & St. Paul, 700 tons for the Chamberlain building, Chicago; coliseum at Des Moines, Ia.; 2,700 tons for a grandstand for the St. Paul State Agricultural Fair Association, and 800 tons for the Union Drop Forge Co., plans for which have been prepared by the Kenwood Bridge Co. Among the contracts let was 1,000 tons for the Pullman Co., taken by the Kenwood Bridge Co.; 342 tons for the John Hancock grammar school at San Francisco, taken by the Ralston Iron Works; 225 tons for the Little Falls power station at Spokane, understood to have been awarded to the Cambria Steel Co.; 327 tons for the Commercial Club building at Salt Lake City, taken by the Minneapolic Steel & Machinery Co.; 200 tons for the Modern Smelting & Refining Co., to M. J. Paterson, of Denver; 2,000 tons for a hotel at Little Rock, Ark., awarded to Brown-Ketchum, of Indianapolis; and 800 tons for several bridges for the sanitary district, the low bidder for which was Geo. W. Jackson, Inc. In general, the level of prices for fabricated material has been raised $2 or $3 a ton. The leading interest is taking very little business in this market at present, having withdrawn from competition at the lowest prices. For mill prices on plain material, see Pittsburg report. Freight to Chicago, 18 cents. We quote from local jobbers' stocks as follows:

All angles, 3 inches and larger, including 6 inches, $1.60 per 100 pounds; angles over 6 inches, $1.70 per 100 pounds base; beams, 3 to 15 inches, inclusive, $1.60 per 100 pounds base; channels, 3 inches and larger, $1.60 per 100 pounds base.

Rails and Track Supplies.—It is generally accepted that the order for from 40,000 to 65,000 tons of rails for the Chicago, Milwaukee & St. Paul railroad has been placed with the Illinois Steel Co. Other rail orders were scattered. Light rails continue slow and attended with weakness in prices. There is little inquiry for track fastenings. For prices on standard sections, see Pittsburg report. We quote as follows:

Light rails, 25-pound to 45-pound, $24; 20-pound, $25; 16-pound, $26; 12-pound, $27. Track supplies, f. o. b. Joliet, angle bars, 1.50c to 1.60c; spikes, 1.80c to 1.90c; track bolts, with square nuts, 2.15c to 2.20c; with hexagon nuts, 2.30c to 2.40c; small railroad and square boat spikes, 1.90c base, f. o. b. Chicago.

Merchant Pipe and Boiler Tubes.—The month of April brought out a slight increase in the tonnage of merchant pipe compared with March, but a volume of business much below normal still obtains. Trade in boiler tubes also continues to be quiet. Prices are well maintained. We quote for lap-weld tubes out of store, 65 off, and for charcoal, 50 off. For mill discounts, see Pittsburg report.

Cast Iron Pipe.—The contracts placed during the past week include 550 tons at Dayton, O., and 700 tons at Hancock, Mich. The pipe contract to cover the 2,000 tons for Salt Lake City has not yet been let.

Wire Products.—A general leveling of prices on all forms of wire products to a common basis with a reduction of $7 a ton on wire nails was announced to take effect the beginning of the current week. Concessions from all of the leading manufacturers have been current for the past few weeks until the former official price became in the end purely nominal. The authorized reduction is a radical cut and should develop a sound bottom. We have revised our quotations and quote for Chicago delivery as follows:

Wire nails, jobbers' carload lots, $1.78; retailers' carload lots, $1.83c; retailers, less than carload lots, $1.93; painted barb wire, jobbers' carload lots, $1.78; retailers' carload lots, $1.83, with 30c for galvanizing; plain wire to jobbers in carloads, $1.58; staples, $1.78. Wire rods, Bessemer, $27; open-hearth, $28; chain rods, $27, f. o. b. Pittsburg.

Old Material.—The appearances of improvement in the strength of finished products has been sufficient to stiffen emphatically the attitude of dealers in scrap. Decidedly higher prices are being asked and it is noticeably more difficult to buy. The consumers are inquiring sufficiently to support the upward tendencies and the necessities of those who are short on contracts have established higher levels. Some of the larger consumers among the malleable and steel foundries are in the market. The list of material offered by the Burlington was sold at an advance over prices quoted a week ago. The scrap offered by the railroads this week includes 2,700 tons by the Northern Pacific, in which there is 1,000 tons of re-rolling rails and 2,000 tons by the Chicago & Northwestern railroad. We have revised our prices and quote gross tons in the first paragraph as follows:

Old car wheels	$14.50 to 15.00
Old iron rails	16.75 to 17.25
Re-rolling rails (4 ft. and over)	14.00 to 14.50
Old steel rails (4 ft. and under)	14.25 to 14.75
Light section relayers, 45 lbs. and under, subject to inspection	21.00 to 23.00
Relaying rails, subject to inspection	19.00 to 19.50
Frogs, switches and guards	13.00 to 13.50
Heavy melting steel	13.25 to 13.75

We quote, net tons, as follows:

No. 1 R. R. wrought	$12.50 to 13.00
No. 2 R. R. wrought	11.50 to 12.00
Knucklers, couplers and springs	12.50 to 13.00
Shafting	15.25 to 15.75
Iron car axles	17.50 to 18.00
Steel car axles	16.50 to 17.00
Dealers' forge No. 1	9.50 to 10.00
Pipes and flues	8.75 to 9.25
No. 1 cast, 150 lbs. and less	13.00 to 13.50
No. 1 mill	7.00 to 7.50
Mixed busheling (Nos. 1 and 2)	8.50 to 9.00
Country sheet	5.00 to 5.50
No. 1 boiler cut	9.00 to 9.50
Boiler punchings	12.00 to 12.50
Cast borings	5.25 to 5.75
Mixed borings, etc	5.25 to 5.75
Machine shop turnings	6.75 to 7.25
Railroad malleable	12.25 to 12.75
Agricultural malleable	10.75 to 11.25
Stove plate and light cast scrap	11.25 to 11.75
Old iron splice bars	14.50 to 15.00

CLEVELAND.

More Vessels Than Needed—Improvement in Finished Lines.

Office of THE IRON TRADE REVIEW,
Browning Building, May 4.

Iron Ore.—As business in finished materials and pig iron improves, with prices somewhat firmer, the probability that prices of iron ore will not be reduced increases. Mining companies are anxious not to reduce wages of employes, and say that it will be absolutely necessary to do so, if ore prices are reduced. The movement of ore from docks to furnaces is of fair volume.

On May 1, the strike of lake seamen and affiliated unions against the open shop principle and welfare plan of the Lake Carriers' Association was inaugurated. Up to the present time, the Steel Corporation has 59 vessels in commission, and independent interests have about 40. This number is more than the actual requirements of the ore trade demand. There has been some violence in connection with the strike, but the vessel owners have lost very few of their employes. The test of the ability of the strikers and sympathizers to get men to leave the boats will come within a few days when vessels arrive from upper lake ports.

On base ores, with the guarantee of 55 per cent on old range and Mesabi Bessemer, and 51½ per cent on old range and Mesabi non-Bessemer, we quote as follows: Old range Bessemer, $4.50; Mesabi Bessemer, $4.25; old range non-Bessemer, $3.70; Mesabi Bessemer, $3.50.

Pig Iron.—Inquiry continues active and many sales from a car load lot to about 2,000 tons have been made, but no transactions involving large

tonnages are reported. Several sales of malleable, amounting to about 5,000 tons, have been made. There is considerably more inquiry for basic. Prices are hardening, and the usual quotation for Cleveland delivery is $15.25 for No. 2. We quote delivered in Cleveland as follows:

No. 1 foundry	$15.50 to 15.75
No. 2 foundry	15.00 to 15.25
No. 3 foundry	14.50 to 14.75
No. 2 southern	15.50 to 15.85
Gray forge	14.00 to 14.50
Bessemer	15.65 to 15.90
Lake Superior charcoal	19.00 to 19.50
Jackson Co. 8 per cent silvery	20.05

Coke.—The market shows very little activity, no change in prices. We quote spot furnace coke at $1.50 to $1.65 at the ovens, and on contract, $1.65 to $1.75; for first class Connellsville foundry coke we quote on shipments up to the second half $2 to $2.25.

Finished Materials.—Much more optimistic feeling prevails. On steel bars 1.15c is now the lowest price for prompt shipment, and while some contracting has been done up to Jan. 1 at 1.15c by nut, bolt, rivet and implement interests, sellers do not encourage contracting at this figure, and at least one large interest is asking 1.20c. One large independent interest has contracted with implement concerns for the period ending July 1, 1910, imposing a premium for delivery after Dec. 31, 1909, but the general disposition on the part of sellers is not to make contracts beyond the present year. It is questionable as to how much of the recent buying of bars and other material has been justified by actual demand, but there is evidence that many manufacturers have been buying for stock, as they believed that bottom prices had been touched. The mandamus suit brought by the McClintic-Marshall Construction Co. to prevent the carrying out of the contract for the Denison-Harvard bridge awarded the King Bridge Co. will be heard in common pleas court May 12. There is good demand for sheet bars. Boiler makers are also buying plates more freely.

Old Material.—There seems to be a little more movement of material from dealers to consumers in small lots, although there has been no change in quotations in the past week. Several fair sized railroad lists are in hand, and it would appear that the railroads at least in this locality are getting better prices for material than are dealers in some lines. We continue to quote f. o. b. Cleveland as follows:

Old iron rails	$15.00 to 15.50
Old steel rails (re-rolling)	13.50 to 14.00
Old steel rails (under 6 feet)	13.50 to 14.00
Old car wheels	14.50 to 15.00
Old steel boiler plate	11.00 to 11.50
Malleable iron (railroad)	12.50 to 13.00
Steel axles	17.00 to 17.50
Malleable iron (agricultural)	11.50 to 12.00
Heavy steel	12.00 to 12.50
Country mixed steel	11.00 to 11.50
Low phosphorus	16.00 to 16.50

We quote, net tons, as follows:

No. 1 R. R. wrought	$12.00 to 12.50
No. 1 busheling	10.00 to 10.50
No. 1 machine cast	12.50 to 13.00
Iron axles	16.00 to 16.50
Axle turnings	8.50 to 9.00
Machine shop turnings	6.50 to 7.00
Grate bars	10.50 to 11.00
Pipes and flues	10.00 to 10.50
Tank iron	9.00 to 9.50
Hoop and band iron	7.00 to 7.50
Sheet iron	5.50 to 6.00
Wrought drillings	6.50 to 7.00
Stove plate	10.50 to 11.00
Cast borings	6.00 to 6.50

CINCINNATI.

Buying of Pig Iron Fairly Active—More Business in Coke.

Office of THE IRON TRADE REVIEW,
First National Bank Bldg., May 4.

Pig Iron.—Buying for the last half of the year continues fairly active and while the advance of 50 cents per ton in southern iron has caused some consumers to decline to cover, sales are being made at $11.50 Birmingham and the market is becoming established on that basis. One of the Southern Ohio producers which has been conspicuous in taking on tonnage at $14 at furnace has announced that, effective May 3, the $14 price nas been withdrawn and that $14.50 is the lowest price that will be accepted. It is believed that other southern Ohio producers will follow, and to this extent the market in southern Ohio pig iron is firmer. At this writing, however, sales are still being made at $14 for No. 2 foundry at furnace for prompt shipment and last half. The buying of the week has been rather more general than in the preceding one. Makers of agricultural implements have taken a good tonnage. One manufacturer in this line bought 2,000 tons and is in the market for 8,000 tons more, divided between high silicon, malleable and low grades. A manufacturer in southern Ohio bought 2,000 tons of malleable for last half. One Ohio consumer took 2,000 tons of Bessemer iron, and a southern Ohio rolling mill is reported to have bought 10,000 tons of basic. Another Ohio melter is in the market for from 500 to 1,000 tons of basic, part northern and part southern. A St. Louis manufacturer bought 2,000 tons of northern foundry. An Indiana foundry bought 2,000 tons of foundry iron from a northern furnace for last half. A southern Ohio manufacturer of tools bought 2,000 tons of northern and southern. An engine builder in Indiana bought 1,000 tons of northern foundry iron for last half. A sale of 1,500 tons to an Indiana maker of agricultural implements is reported, deliveries running through the remainder of the year. There is still considerable inquiry for tonnages ranging from 200 and 300 tons up to 2,000 tons, but on practically all of the inquiries as well as the sales the deliveries are for the last half of the year. There is practically no call for prompt shipment and second quarter. Some southern producers are asking $11.50 for Birmingham for prompt shipment but $11 can still be done through the second quarter; although there are but few open quotations out on this basis. We quote for prompt shipment and May and June delivery, delivered Cincinnati, based on freight rates of $3.25 from Birmingham and $1.20 from Ironton, as follows:

Southern foundry No. 1	$14.75 to 15.25
Southern foundry No. 2	14.25 to 14.75
Southern foundry No. 3	13.75 to 14.25
Southern foundry No. 4	13.25 to 13.75
Southern No. 1 soft	14.75 to 15.25
Southern No. 2 soft	14.25 to 14.75
Southern gray forge	13.25 to 13.50
Northern No. 1 foundry	15.70 to 16.20
Northern No. 2 foundry	15.20 to 15.70
Northern No. 3 foundry	14.70 to 15.20
Northern 8 per cent silicon	19.70

Finished Material.—Specifications on contracts are fair and the market rules slightly steadier on new business. For steel bars 1.15c can still be done, but less than this price is not frequent. Some mills are holding to the 1.20c basis Pittsburg. Plates and shapes are quoted at both 1.25c and 1.30c Pittsburg. The new business has not been large, but there is something doing all the time, and to this extent the market is showing improvement. Iron bars are irregular and difficult to quote.

Coke. — Considerable activity has been noted in the market for coke the last week. A sale of 100,000 tons of Wise county furnace coke to southern furnace interests has been reported, but the price was not made public. Foundries have been more inclined to cover their future requirements and quite a number of contracts have been made. Spot prices continue to rule lower than contract and the following quotations represent the range. The inside prices reflect the market on prompt shipment coke, while the outside figures are the full asking prices on contracts:

	PER TON.
Wise county furnace coke	$1.60 to 1.85
Wise county foundry coke	2.00 to 2.25
Pocahontas furnace coke	1.65 to 1.85
Pocahontas foundry coke	1.85 to 2.25
Standard Connellsville furnace coke	1.60 to 2.00
Standard Connellsville foundry coke	1.90 to 2.40

Old Material.—The market continues irregular, but slightly steadier in tone and sales have been a little more

frequent. We quote dealers' prices here as follows:

Old No. 1 R. R. wrought, net tons	$13.50 to 14.00
No. 1 machinery, net tons	13.00 to 13.50
Old iron rails, gross tons	15.50 to 16.50
Old steel rails (re-rolling) gross tons	13.50 to 14.00
Old short lengths, gross tons	12.00 to 13.00
Old iron axles, net tons	15.50 to 16.50
Heavy melting scrap, gross tons	12.00 to 12.50
Stove plate, net tons	11.00 to 11.50
Heavy turnings	7.50 to 8.00
Cast borings, net tons	4.50 to 5.50
Car wheels, gross tons	13.50 to 14.50

PHILADELPHIA.

Railroads and Equipment Concerns Appear as Pig Iron Buyers.

May 4.

Pig Iron.—Pig iron sales in this district during April were generally the largest of any month since the beginning of the depression, being somewhat in excess of those made during either October or November, when an active buying movement was on. The great bulk of the April selling was during the last two weeks, and so far it appears that the current month is also destined to be equally active. Aside from rumors of one moderate sized basic sale, which lacks substantiation, and some quiet nibbling which has not yet reached the inquiry stage, there has been no interest in steel-making irons. One small lot only of low phosphorus is under negotiation, and there have been no local developments in malleable. The large buying movement has been and is still concerned almost entirely with foundry irons, with now and then a fair lot of pipe-making grades. Prices are as yet no higher, the minimum for No. 2X foundry being $15 at the furnace, and on this basis the usual differentials for lower grades have been largely eliminated. At current prices there has been some selling for fairly forward delivery and at only a slight premium a few interests have been willing to take on some attractive tonnages for the remainder of the year. The feature of the past week has been the entrance of railroads and railway equipment manufacturers into the open market. Several blocks, ranging from 2,000 to 5,000 tons, have been disposed of to this class of consumers and several other good tonnages are under negotiation. The encouraging thing in this connection is that the buying is not so much due to the belief that prices are low and it is a good time to contract, as to the fact that railway earnings are making substantial gains and are steadily approaching normal. There is also a marked improvement in the inquiry from the foundry trade. We quote, early delivery at eastern Pennsylvania plants, as follows:

No. 1X foundry	$16.25 to 16.75
No. 2X foundry	15.75 to 16.25
No. 2 plain	15.25 to 15.75
Standard gray forge	15.00 to 15.25
Basic	15.00 to 15.50
Low phosphorus	19.00 to 20.00
No. 2 Birmingham	15.75 to 16.25
No. 2X Virginia	16.50 to 17.00
No. 2 plain Virginia	16.00 to 16.50

Finished Materials.—The structural market is without new developments, as none of the large propositions reported pending a week ago has been closed. In this district, however, a considerable number of buildings are planned for the summer and a very fair tonnage should develop in this connection. Railroads and ship yards are making small purchases of plain materials from time to time, but no large lots have been placed recently. Nothing further has been heard of the reported car purchase of the B. & O. Plain materials are now selling absolutely on a 1.15c minimum for bars and a 1.25c minimum for plates and shapes, Pittsburg base. Mills are becoming somewhat congested with orders and deliveries are rather slow, on certain lines ranging up to five or six weeks. On the price level quoted, business is being taken for delivery four or five months in advance. We quote: Structural shapes, 1.45c to 1.55c; plates, 1.45c to 1.50c, with the usual extras; sheets, No. 28, 2.80c; steel bars, 1.30c to 1.40c; refined iron bars, 1.35c to 1.45c.

Old Materials.—The entire situation is stronger, and mills are now willing to take on all the steel scrap they can procure at current figures. The labor situation in this district has practically been cleared up by the settlement during the week of the puddlers' strike at Conshohocken. Steel axles, rails, car wheels, pipe and turnings are all in fair demand and prices are tending upward. We quote, eastern Pennsylvania delivery, as follows:

Old steel rails (re-rolling)	$15.00 to 15.50
No. 1 steel scrap	13.75 to 14.25
Old steel axles	17.50 to 18.00
Old iron axles	18.50 to 19.50
Old iron rails	16.50 to 17.00
Old car wheels	14.50 to 15.00
Choice scrap R. R. No. 1 wrought	16.00 to 16.50
No. 1 yard scrap	14.00 to 14.50
Machinery scrap	14.00 to 14.50
Low phosphorus scrap	17.00 to 18.00
Wrought iron pipe	13.50 to 14.00
No. 1 forge fire scrap	12.00 to 12.50
No. 2 forge fire scrap, ordinary	8.50 to 9.00
Wrought turnings	10.50 to 11.00
Axle turnings, heavy	11.00 to 11.50
Cast borings	9.00 to 9.50
Stove plates	12.00 to 12.50

ST. LOUIS.

Active Buying of Pig Iron and Prices Are Advancing.

May 3.

Pig Iron.—Southern No. 2 iron is firm in the St. Louis territory at from $11.50 to $12, Birmingham, for prompt and future deliveries, with most of the furnaces that have been offering iron for the last quarter holding strong at $12. Orders aggregating from 12,000 to 14,000 tons, all grades, have been booked in the last few days for future shipments. Of this tonnage, one order was secured by one St. Louis concern for 10,000 of foundry iron for shipment over the remainder of the year, beginning immediately. Inquiries were fair last week, but slightly less than for the preceding week. Quite a number of orders ranging from 25 to 100 tons, and one for 150 tons, were placed this morning. These came from all parts of the territory—north, south, east and west. One other firm reports having booked one order this morning for 50 tons of No. 1 soft at $12.50, Birmingham, for May shipment, and another order for No. 2 Birmingham, at $12, May delivery, although the same firm has heard of $11.50 prices on the same grade of iron, and one quotation as low as $11. One Ohio furnace is reported to have withdrawn from the market, having reached its estimated production for the second and third quarters. One large interest had out an inquiry last week for 10,000 tons of basic, and it is not believed that more than half of the order has been placed, if indeed any of it has. Our quotations, delivered, to which the freight of $3.75 from Birmingham has been added, follow:

No. 1 southern	$15.75 to 16.25
No. 2 southern	15.25 to 15.75
No. 3 southern	14.75 to 15.25
No. 4 southern	14.25 to 14.75

Coke. — The best-selected 72-hour Connellsville foundry coke is strong at from $2 to $2.25, the lower price being for prompt shipment, and the higher one for delivery over the second half. Connellsville 48-hour furnace coke is offered at $1.50 to $1.75, ovens. The quotations on Virginia and West Virginia grades range from $2.15 to $2.50. The freight rate on coke from Connellsville and the Virginia fields is $2.80 to East St. Louis and St. Louis, and $2.70 from the Virginias when the shipment is consigned beyond St. Louis.

Old Material.—Prices on scrap iron underwent no change last week and remain as follows:

Cast iron borings, free from foreign material, net tons	$ 5.00 to 5.50
Steel axle turnings, gross tons	10.00 to 11.00
Steel railroad axles, net tons	16.50 to 17.00
Iron railroad axles, net tons	17.50 to 18.50
Miscellaneous steel scrap, gross tons	9.00 to 11.00
Old car wheels, gross tons	14.50
No. 1 railroad cast scrap, net tons	12.00 to 12.50
Heavy machinery cast, net tons	11.50 to 12.50
Stove plate and light cast, net tons	10.00 to 11.00
Sheet iron, net tons, uncut	4.00 to 5.00
No. 1 railroad wrought, net tons	12.00 to 13.00
Railroad malleable, net tons	12.00 to 12.50
Heavy melting steel, net tons	11.00 to 12.00
Relaying rails, net tons	16.00 to 17.50

BUFFALO.

Stronger Tone of Pig Iron—New Bridge Company Will Erect Plant.

Office of THE IRON TRADE REVIEW, 932 Ellicott Square, May 4.

Pig Iron.—No noteworthy change has occurred in the pig iron market the past week except a trifle stronger tone found mostly in inquiries but not in business done. Prices may be approximated only and we quote f. o. b. Buffalo as follows:

No. 1X foundry	$16.25 to 16.75
No. 2X foundry	15.75 to 16.25
No. 2 plain	15.25 to 15.75
No. 3	15.00 to 15.50
Malleable Bessemer	16.50 to 17.00
Gray forge	14.75 to 15.25
Charcoal	20.50 to 21.00

Finished Products. — The finished material line continues holding an average amount of business. Practically all structural interests figured on the McCarthy building contract, which, it is believed, will be awarded before the close of the week. Bids were opened yesterday. The proposition involves about $30,000.

The Lackawanna Bridge Co., incorporation papers of which have just been filed at Albany, will erect and equip a structural steel and bridge shop at Buffalo, N. Y., with a monthly capacity of about 2,500 tons. It is stated that this company has no connection with the Lackawanna Steel Co., near whose works it will be located, other than it will buy its steel from this company. The interests behind the new company are the same as those of the Worden-Allen Co., of Milwaukee.

BIRMINGHAM, ALA.

Pig Iron Manufacturers Encouraged—Prices Firmer.

May 3.

Alabama pig iron manufacturers are greatly encouraged now over conditions and the prospects. There was more iron sold during the month of April than during any month in quite a while. The sale of the considerable quantity of iron last month has aroused talk of resumption of operations at furnaces in this district. Five furnaces are either ready now or will be in a short while in Alabama. There was no curtailment of production nor increase during the past month.

Pig iron quotations in the Birmingham district have stiffened in the last two weeks, no iron now being sold in this territory under $11.50 per ton and some of the furnace companies asking $12 per ton, No. 2 foundry. Practically all the companies in this district sold more than their make during the month of April.

The sale of the properties of the Southern Steel Co. being confirmed by the federal judge, it is believed that within six to eight weeks the work of re-organization can be accomplished and that there will be some resumption of operations at various industries of this corporation.

The following quotations for old iron material are given in the southern territory:

Old iron rails	$13.00 to 14.00
Old iron axles	13.00 to 14.00
Old steel axles	12.00 to 12.50
Old steel rails	9.00 to 9.50
No. 1 railroad wrought	12.00 to 12.50
No. 2 railroad wrought	10.00 to 10.50
No. 1 country	8.00 to 8.50
Heavy melting steel	8.50 to 9.00
Old steel boiler plate	7.00 to 7.50
No. 1 machinery	10.00 to 10.50
Old standard car wheels	12.00 to 12.50
Stove plate	8.50 to 9.00
Cast iron borings	4.00 to 4.50

NEW YORK.

Pig Iron Buying Extends—Important Building Projects Developing.

Office of THE IRON TRADE REVIEW, Room 1005, No. 90 West St., May 4.

Pig Iron.—The buying movement which set in late in April has assumed such proportions that furnaces have begun to take advantage of the stronger situation. In a few instances, there have been actual price advances, a good many producers have assumed the position of selling as little iron as possible at the current level, and everywhere there is a disposition to insist on a considerable premium for delivery running late in the year. Apparently there is no longer any doubt on the part of consumers that the bottom has been reached, and buying is being done by practically all classes. Basic is still quiet and there is no confirmation for the report that an eastern Pennsylvania plant had taken on 6,000 tons at a low price. One eastern interest recently secured a re-arrangement of current deliveries, this involving the purchase of a small tonnage, and a fair sized lot is now under negotiation with prospect of early closing, but with these exceptions the basic market has shown practically no activity throughout this year. The malleable buying in New England seems to be over for the present; a good tonnage has been taken by Buffalo and Virginia furnaces during the past two weeks.

It is in foundry iron that interest is now centered. A number of sales ranging from 5,000 tons down to 1,000 tons, with a good sprinkling of smaller lots, have been made within the past few days, and the movement gives every indication of being permanent. In fact, the buying so far has been confined to certain districts, leaving whole sections yet to cover their requirements, and the outlook for brisk business for some time is attractive. The General Electric inquiry, running close to 10,000 tons, has been closed, the bulk going to the Buffalo district, though 2,200 tons of low phosphorus will be furnished by a central Pennsylvania interest on the basis of about $15, furnace. On foundry, the present minimum is $15, furnace, for northern 2X, prompt delivery, with $15.50 ruling on third quarter iron; grade differentials are being observed to a greater degree. On Buffalo product, the low level is now $14.25 for immediate delivery, and usually the $14.50 price prevails. Several sales of charcoal iron are noted, the price ranging from $21.50 to $22, delivered in this district and New England. We quote, early delivery at New York tidewater, as follows:

Northern foundry No. 1	$16.25 to 16.75
No. 2X foundry	15.75 to 16.25
No. 2 plain	15.25 to 15.75
No. 2 southern foundry	15.00 to 15.50
Malleable	16.25 to 16.75
Basic	15.50
Gray forge	15.00 to 15.25

Ferro-Alloys.—A part of the inquiries referred to a week ago are still pending and in addition some small tonnages have come up. Recent sales include 100 tons of ferro-manganese, which has stiffened and is now held at about $42, seaboard. Ferro-silicon sales aggregate 150 tons, and the current level is about $60, Pittsburg. The entire alloys market is stronger.

Finished Materials.—A number of large building operations are developing in this city. The Hewitt interests have had plans prepared for a building on Fourth avenue, running through from Twenty-seventh to Twenty-eighth streets; Bethlehem sections are specified. The Fourth avenue front from Eighteenth to Nineteenth streets is also to be occupied by a large loft building, and it is probable that the Ashland house at Twenty-fourth street will be replaced before a great while. The past week has been featured by a large number of small lettings. The Onondaga hotel at Syracuse, 1,700 tons of steel, has gone to the Brown-Ketcham Iron Works. Lackawanna steel will be employed, in two New England cotton mills aggregating about 2,300 tons. Some 800 tons for a warehouse of the New York & Pennsylvania Co. will be furnished by the Jones & Laughlin Steel Co. Levering & Garrigues have the contracts for the Hyde building in this city, 2,100 tons, and the Trinity warehouse, 2,200 tons; the Radley Co. has taken a Broadway building re-

quiring 600 tons, and the Wills building on Fifth avenue, 750 tons, has gone to the Hay Foundry & Iron Works. Two Akron, O., buildings have been placed, one requiring 1,000 tons for the Diamond Rubber Co. going to the Berger Iron Works and the other, an 850-ton structure for the Goodrich Rubber Co., to the Interstate Engineering Co. The McClintic-Marshall Construction Co. will supply 200 tons of steel for a smelter in Arizona and the Cambria Steel Co., 350 tons for a foundry at Schenectady for the General Electric Co. The Indiana Bridge Co. took 700 tons for the Pittsburg Plate Glass Co. plant at Kokomo, Ind., the Fort Pitt Co. secured the Washington-Allegheny county highway bridge, 2,000 tons, and the Mitchell Motor Car factory, 600 tons, went to A. Bolter & Sons. A new foundry for the Symington Co. at Corning, N. Y., was awarded to the Riter-Conley Co., 2,200 tons.

In railroad work, it is understood that an independent interest has secured 2,000 tons from the Missouri Pacific lines, and that about 6,500 tons remains to be awarded. An independent interest has also taken 800 tons for the G. H. & S. A. The McClintic-Marshall Construction Co. has secured 400 tons of bridge work for the Indianapolis Union and 65 tons for the Lehigh. The Pennsylvania Steel Co. will supply 100 tons for the Long Island railroad, 200 tons for the Missouri Pacific and a small tonnage for the Raritan River. The Toledo, St. Louis & Western has ordered 550 tons of bridge work from the American Bridge Co. The Erie tonnage, noted a week ago, included about 2,000 tons for the Pennsylvania Steel Co. and 3,500 tons for the American Bridge Co. besides a considerable lot for another interest. The New York Central is taking bids on 100 steel underframes, requiring 750 tons. Bids go in early next week on the 17,000 tons required for track elevation purposes of the Philadelphia & Reading.

There has been a very general advance in the price of light rails during the last few days, and a number of interests are now holding at $27 for 25 to 50-pound sections. The Pennsylvania Steel Co., in addition to a recent sale of 5,000 tons for a New Haven subsidiary, has taken an order for 550 tons for the Long Island.

Angles, 3 to 6 inches x ¼-inch and heavier, 1.46c; beams, 3 to 15 inches, 1.46c; tees, 3 x ¼-inch and heavier, 1.51c; plates, carloads, tank, 1.46c; marine boiler, 1.86c; bar iron, 1.35c to 1.40c; soft steel bars, 1.31c to 1.36c; sheets, No. 28 black, 2.56c.

Cast Iron Pipe.—At the Boston letting last Friday, the U. S. Cast Iron Pipe & Foundry Co. was low bidder on 8,000 tons of 60-inch and the Standard Cast Iron Pipe was low on 3,000 tons, principally 24-inch. Niagara Falls will open bids May 31 on several miles of small pipe. The Alfred E. Norton Co. secured the recent New York City letting—1,000 tons—and pipe of the leading interest will probably be employed.

Old Material.—The situation shows greater strength and prices are higher on several lines, but buying at these figures is light. The railroad lists of the month are of usual size. We quote gross tons, New York delivery, as follows:

Old steel rails (re-rolling)	$13.50 to 14.50
Relaying rails	19.00 to 19.50
Old car wheels	12.50 to 13.00
Old iron car axles	16.00 to 16.50
Old steel car axles	14.00 to 14.50
Heavy melting steel	11.00 to 11.50
No. 1 railroad wrought	13.50 to 14.00
Iron track scrap	11.50 to 12.00
Wrought pipe	10.00 to 10.50
Cast borings	6.00 to 6.50
Wrought turnings	7.00 to 7.50
Heavy cast scrap	12.50 to 13.00
Railroad malleable	11.00 to 11.50
Stove plate	9.50 to 10.00
Grate bars	9.00 to 9.50

BRITISH MARKETS.

Inquiry as to American Billets—Pig Iron Improves.

Office of THE IRON TRADE REVIEW,
Prince's Chambers, Corporation St.,
Birmingham, Eng., April 24.

The feeling of confidence among pig iron smelters has been increased during the week and prices are slightly better. Today's quotation for No. 3, Cleveland, was 47s 6½d ($11.63), which is about the same as last week. The improved buying has arrested the growth of stock, the amount now in store being 202,600 tons, which is practically the same as a week ago. Shipments have greatly improved, and it is hoped that for April they will reach 120,000 tons, which is the largest quantity recorded since July. The tone of the market has been assisted by the strike in South Lincolnshire, which has reduced the output by 8,000 tons per week and has diverted some business to Northamptonshire and Derbyshire. In the Birmingham district, the improvement has been still more marked. Practically all consumers have hastened to renew contracts, prices realized being from 6d to 1s 6d per ton above those recently prevailing. The furnaces are now well booked, forward smelters declining large orders except at material advances. There is more buying of hematite, mixed numbers being sold on the East Coast at 55s ($13.45). Several blast furnaces are being blown in in different parts of the country.

Finished Material.—It cannot be said that the finished market shows anything like the strength manifested in pig iron, but there is a noticeable increase in inquiries, and merchants are now replenishing their warehouses. Here and there the best houses are declining to do further business at the recent rumous figures, but other firms are still accepting them. There seems to be no understanding whatever with regard to selling prices and it is notorious that some makers of finished iron are losing money.

Americans will be interested in a question put in the house of commons to the president of the board of trade by Mr. Fell, who inquired if he had received information of the offer in this country by trusts and companies in the United States to sell billets at a price below the cost of production, and if this should prove to be the fact, would he consider the question whether this was a case in which retaliation might be applied with advantage to several manufacturers of steel in this country, thus saving them from a very heavy loss. Mr. Tennant, on behalf of the board of trade, replied: "I have no information as to any such offer."

METAL MARKETS.

NEW YORK.

May 5.

Copper.—With the volume of business moderate, both for foreign and domestic consumption, the market has continued without change throughout the week. Offerings are somewhat more free and now and then concessions are offered in an effort to develop business. We quote: Lake, 12⅞c to 13c; electrolytic, 12½c to 12⅝c; castings, 12⅜c to 12½c.

Pig Tin.—In sympathy with a sharp decline on the London market for spot metal, the local situation has weakened and current selling for early shipment is on the basis of about 29c. Domestic consumption continues good.

Pig Lead.—There is no change in the market and price continues at 4.20c to 4.25c, New York. The demand is not quite so brisk.

Spelter.—Orders are few and are made the subject of brisk competition, but the price level continues at 5.02½c to 5.07½c, New York.

Antimony.—The market is less active but prices continue at: Cookson's, 8¼c to 8½c; Hallett's, 8c to 8¼c; ordinary brands, 7⅞c to 8c.

Gayley Blast and Moisture.—A correction should be noted in connection with the article on page 805 of the

issue of April 29, describing the charts graphically illustrating the action of the Gayley dry blast system. The scale of grains of moisture is not shown on the charts, the readings of which refer only to the temperature and of the blast. The main purpose of the chart was merely to show the large quantity of moisture removed and the regularity obtained after removal.

ST. LOUIS.

May 3.

Lead and Zinc.—Zinc ore brought a high price of $43.50 a ton in the Missouri-Kansas-Oklahoma district last week. This was on an assay base of $41 for 60 per cent zinc. The sales of ore on a $41 base were much heavier last week than during the preceding week, but the buying movement did not start in earnest until late. Jobbers bought ore in small lots at from $37 to $38 a ton, and some of the buyers did not figure in the purchases because they had laid in a supply to last them over the time.

The spelter market jumped to $5 at St. Louis on Saturday, a marked strength being manifested in the market toward the close of the week.

Lead ore dropped $2 from the average base price for 80 per cent ore that prevailed during the preceding week. The best price reported to have been paid for lead ore was $55 a ton. The lead ore market at St. Louis closed at $4.15. A high price of $25 was paid for extra high grade calamine, although the quotations ranged from $17 to $20 base for 40 per cent ore.

MAKING IMPROVEMENTS.

The Huron Steel & Iron Co., Norwalk, O., advises respecting its recently noted improvements that in addition to the two 25-ton open-hearth furnaces which it is preparing to install, plans are being made for the addition of a new hammer shop, 64 x 180 feet, in which will be placed all of the hammers with furnaces and complete equipment. It is the company's intention also to install an additional plate mill and add some shears. When the improvements now figured on are completed, the plant will have been tripled in capacity, and the company will be able to care for the additional business that is being offered. Further improvements are also being made in the oil tool equipment department, as business has been coming in so rapidly that the company has been taxed to its limit in caring for the orders.

HOPEFUL OUTLOOK

For Settlement of Wage Scale With Amalgamated Association.

(Special Telegram.)

Detroit, May 5.—The annual meeting of the Amalgamated Association of Iron, Steel and Tin Workers is now being held for the formulation of the 1909-10 wage scale. The first session was held in the G. A. R. hall yesterday morning, approximately 100 delegates being present. Circuit Judges J. W. Donavan and Alfred J. Murphy delivered addresses of welcome and president P. J. McArdle responded. At the afternoon session the committee on credentials was appointed and reported this morning. Pre-convention conferences between the representatives of the Amalgamated Association and the members of the Western Bar Iron Association mark a radical departure in the proceedings of previous years when these conferences were deferred until after the wage scales were prepared by the workers' organization.

"By holding these conferences prior to our meeting," said John Williams, secretary-treasurer of the Amalgamted Association, "we learn in advance what the Western Bar Iron Association deems a fair scale, as well as its attitude on other important questions. Formerly, the Amalgamated alone has told how it stood on wage questions prior to the adoption of the scale. There were 18 or 20 Amalgamated delegates and about 15 Western Bar Association representatives at this early conference, and we believe that it will help to bring about an earlier settlement of the wage question than heretofore."

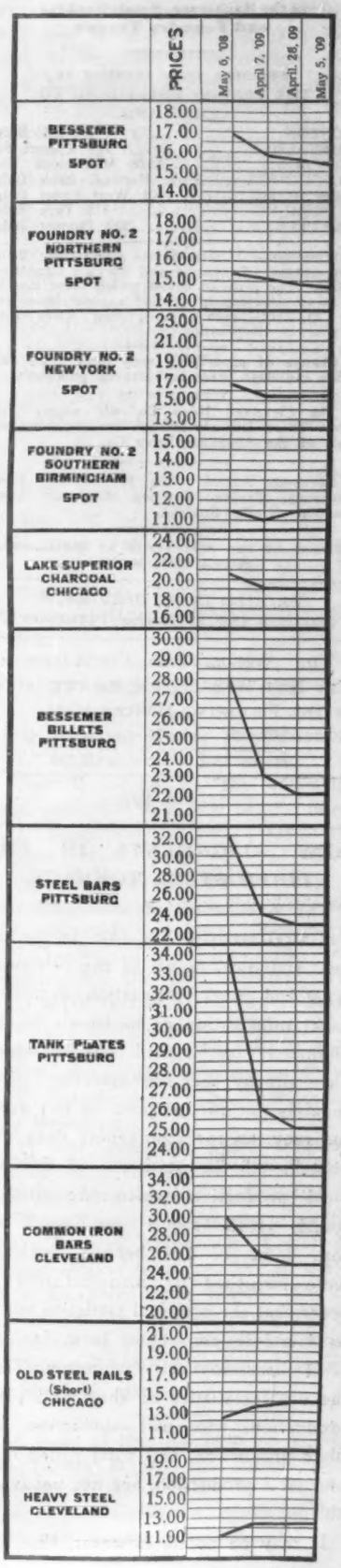
President P. J. McArdle was of the opinion that last year's wage scale would probably be continued another year. He also stated that the steel mills are operating at about 65 per cent of their normal capacity.

CRESSON MEDAL TO GAYLEY.

James Gayley has been awarded the Elliott Cresson medal of the Franklin Institute, Philadelphia, this being the highest award made by that organization. This comes in recognition of his services in connection with the dry air blast, the recommendation of the institute's committee stating that the award be made "because of the originality of this invention and the importance of the results accomplished." Mr. Gayley sailed Tuesday for a brief business visit to Germany.

The Bethlehem Steel Co. blew in the fourth stack April 18, which had been out for relining.

PRICE CHART.



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May 6, 1909.

NEW ALIGNMENTS IN FINISHED STEEL TONNAGE.

The publication of additional iron and steel statistics for 1908, in the annual statistical report of the American Iron and Steel Association, furnishes exact information as to trends in the alignment of finished output which have already been recognized. Unfortunately for the purpose of full comparisons, the present report does not contain all the statistics of finished steel production which are usually found, as the report was issued before some of the belated statistics were furnished by manufacturers in order that the principal statistics might be found in convenient form for the tariff discussion at Washington. Thus the usual statistics of sheet and plate production, wire nail production, tin plate production, and total rolled iron and steel production, are not yet available.

It may be noted, however, that the production of pig iron declined from 1907 to 1908 by 38.1 per cent, the production of all kinds of steel ingots and castings by 39.9 per cent, the production of rails by 47.1 per cent and the production of structural shapes by 44.1 per cent.

In 1907, rails and structural shapes comprised 30 per cent of the total rolled steel production, and if they declined 47.1 and 44.1 per cent respectively, in 1908, while the total steel output declined only 39.9 per cent, other lines must have suffered correspondingly smaller reductions. The other lines are, in general, more highly finished lines than structural shapes and rails. The tendency is for consumption of the lighter lines to increase, relatively, as steel comes into more and more general use, and it is the tendency also, following a financial disturbance, for large purchases, which generally require to be "financed," to fall off more heavily than purchases of the lighter lines, which are consumed largely by the common people.

Statistics of one important finished line are available, those of wire rods. The wire rod output in 1908 fell off only 10 per cent from 1907, the decrease being from 2,017,583 tons to 1,816,949 tons. Wire is almost ubiquitous, and it is rather a startling evidence of the survival of demand in such a product that it should decline but 10 per cent when steel as a whole declined 40 per cent. In 1908 the production of wire rods fell short of the rail by only five per cent, the figures being 1,816,949 tons and 1,921,611 tons. For years past, practically until 1908, the wire rod output has averaged only about half the rail output.

A FEW FACTS.

A correspondent in the *Steelton Reporter* complains of the attitude of THE IRON TRADE REVIEW in a recent editorial which sought to justify the making of moderate reductions in iron and steel workers' wages. The correspondent asks for "concrete facts" which would support these wage reductions. These "concrete facts" are the heavy declines in the selling prices of finished steel products which are too familiar to our readers to make it necessary, in such a discussion, to refer to them in detail. They have ranged from $5 to $12 per gross ton in every important finished steel product except rails. Even with the wage reductions which have been made, it is commonly accepted as a fact in the steel trade that, comparing wage costs in iron and steel operations and freights paid on raw materials, the present selling prices of finished steel products are easily the lowest on record.

The correspondent of *The Reporter* asks THE IRON TRADE REVIEW to explain why it was necessary for some eastern iron manufacturers to reduce the wages of their employes, although the Steel Corporation has not done so. It is not yet certain that the Steel Corporation will not reduce wages. If it does not do so, it may be because, owing to its splendid organization, large ore deposits, and other conditions, it is better able to pay higher wages than are some of the other manufacturers. While there are certain general facts that apply to some extent to all manufacturers, they do not apply with equal force to all. In some cases, the matter of lowering wages depends upon the judgment of the directors of the companies as to whether a reduction in wages really accomplishes the desired reduction in cost. Some manufacturers hold that the lowering of wages makes labor so dissatisfied that costs are not really reduced. The directors of the Steel Corporation are apparently inclined to take this view, which is the one entertained by the correspondent of *The Reporter*.

An element of unrest has been created by the publication at various times of wholly erroneous statements as to the United States Steel Corporation's "water," and this is shown by the words of the correspondent referred to: "It has been stated in public print and never denied, as far as the writer knows, that Mr. Carnegie is today drawing 5 per cent interest on $500,000,000," etc. If no denial has really been made of such a statement, it was doubtless because the statement was not considered worth denying. To fill the blank which is claimed, the statement is

here denied most emphatically. Mr. Carnegie received no such sum in securities of the Steel Corporation. When the corporation was formed, it issued only $304,000,000 of bonds, so that nobody could have received more than that amount. Those bonds were issued, first, to exchange, even, for $160,000,000 bonds of the Carnegie company, and to exchange, at 50 per cent premium, for $96,000,000 of the $160,000,000 stock of the company. Mr. Carnegie owned less than $96,000,000 in bonds and less than $96,000,000 in stock, therefore receiving less than $240,000,000 in Steel Corporation bonds, or less than half the $500,000,000 mentioned in the correspondence referred to, and he does not now hold all that he received, having distributed large blocks for endowment funds.

PROBABLE RESULTS OF FREE TRADE.

Editor THE IRON TRADE REVIEW:

In regard to your comment on my letter, published in your issue of April 22, I beg to say: I should expect that your intelligent readers would find difficulty in harmonizing your theory that *exceptionally high prices for pig iron* and *dismantling of blast furnaces* would go together.

If, as you think, my plan would result in the dismantling of nine-tenths of the blast furnaces of the country, and that this would be followed by shortage, and then by higher prices than for many years—if this is so easy for you to foresee, then what should prevent the blast furnace interests from foreseeing it too, and that, in time to prevent the dismantling of quite so great a per cent of the furnaces?

I supposed the protective tariff was intended to sustain prices; but you assert that my plan would result in higher prices than for many years!

I have made a somewhat serious study of politics—economic law, for something more than the third of a century past, but nothing in my reading or excogitation has suggested the peculiar interaction of the laws of *supply* and *demand* that you assume.

EDWARD HOWELL PUTNAM.

Moline, Ill., May 3.

In his recent letter to THE IRON TRADE REVIEW, Mr. Putnam said: "The public has a right in justice to draw its entire supply from the sources that can produce at the lowest cost." The adoption of this policy would, as we stated, result in the dismantling of a great many blast furnaces. Later, pig iron prices would advance and the production in this country would increase somewhat, but the certain tendency would be, in the long run, to lower prices to those at which pig iron could be made by foreign labor. Foreigners instead of Americans would be in control of the market. We do not believe that either manufacturers or their employes are ready to adopt such a policy.

MACHINERY MEN

Will Meet in Convention at Pittsburg Next Week.

The fourth annual meeting of the National Supply and Machinery Dealers' Association in joint convention with the American Supply and Machinery Manufacturers' Association, will be held in Pittsburg, May 12, 13 and 14, at the Fort Pitt hotel. The sessions of both associations will convene in the morning at 10 o'clock and in the afternoon at 2 o'clock.

The sessions of the Machinery Dealers' Association on May 12 will open with the greeting by President Puchta, and annual reports will be heard. Wednesday afternoon's session, with Vice President Henry Prentiss presiding, will be devoted exclusively to the consideration of machinery subjects. Thursday morning there will be held a joint session of the Machinery Dealers' and Machinery Manufacturers' Associations, when addresses will be delivered and reports of conference and grievance committees will be presented. F. A. Hall, of the Yale & Towne Mfg. Co., will speak on "The Necessity for Clearly Defined Trade Policies Among Manufacturers and Dealers, and the Best Methods of Obtaining Results;" and W. E. Frick, of the Frick & Lindsay Co., Pittsburg, on "The Value of Association Work in Promoting and Advancing the Interests of Manufacturers, Dealers and Consumers." In the afternoon, the Machinery Dealers' Association will resume its sessions, and continue them over into Friday. Election of officers will be held Friday afternoon, and adjournment will be taken at 3 o'clock to meet in joint session with the Machinery Manufacturers' Association for the purpose of installing the newly-elected officers of both associations.

The American Supply and Machinery Manufacturers' Association will be called to order on Wednesday morning by President Charles F. Aaron. Various reports of officers and committees will be heard. This session will be open to members only. In the afternoon the session will be open to all manufacturers, when addresses will be delivered by E. H. Hargrave, of the Cincinnati Tool Co., Cincinnati, and by D. K. Swartout, of the American Blower Co., Cleveland. On Thursday will be held the joint session of the National Supply and Machinery Dealers' Association, and the American Supply and Machinery Manufacturers' Association. On Thursday afternoon, the Manufacturers' Association will discuss various matters pertaining to resale prices and sales to manufacturers, etc. On Friday morning election of officers will be held, and in the afternoon the executive committee will meet at 2 o'clock. At 3 o'clock will be held the joint session with the Machinery Dealers' Association for the purpose of installing the new officers.

Extensive preparations have been made for the entertainment of not only the members of the two associations, but also of the ladies accompanying them, including the chartering of the Grand opera house, Wednesday evening, for a vaudeville show, to be followed by a "Dutch lunch" at the Fort Pitt hotel. Sight-seeing trips through the city Thursday will be followed by a complimentary banquet Thursday evening, to be tendered by Pittsburg jobbers and manufacturers to visiting manufacturers, dealers and guests at 7:30 o'clock. The toastmaster will be Henry B. Lupton, of the Oliver Iron & Steel Co., Pittsburg, and responses will be made by United States Senator George W. Oliver and Hon. ("Private") John M. Allen.

STRONG PLEAS MADE

For Merchant Marine Rehabilitation at Shenango's Launching.

The launching of the steamship Shenango, the flag ship of the Shenango Steamship Co., took place at the Ecorse, Mich., yards of the Great Lakes Engineering Works, May 1. Several thousand spectators witnessed the successful launching. Miss Sarah C. Chaplin, of Sewickley, Pa., was sponsor for the big freighter. The ship is 607 feet long and 58 feet beam, and will carry about 10,000 tons of iron ore. Mr. and Mrs. W. P. Snyder, together with a party of Cleveland and Pittsburg friends, witnessed the launching.

At the luncheon which followed, strong pleas for the rehabilitation of the merchant marine were made by William Livingstone, president of the Lake Carriers' Association; Col. J. M. Schoonemaker, vice president of the P. & L. E. railroad, and others. The remarks of the speakers were full of optimism as to the immediate future of business and the continued growth of the lake marine.

A force of men has been put at work on repairs around the Atlantic blast furnace of the Republic Iron & Steel Co., at New Castle, Pa., which has been idle four months.

MECHANICAL ENGINEERS

Cordially Welcomed to the National Capital—Large Reception.

Washington, D. C, May 5.—The regular spring meeting of the American Society of Mechanical Engineers convened at the New Willard Hotel on Tuesday evening. The usual program was somewhat altered, the regular reception, formerly held later in the evening, being made the opening function. About 400 attended in the ball room of the hotel. The society was welcomed by D. S. Carll on behalf of the Washington Society of Engineers, and by Hon. Henry B. MacFarland, president of the board of district commissioners. Mr. MacFarland traced the work of the engineers in the development of the city, pointing out special features of their work, such as the pumping station, filtration plant, bridges, central power station, new buildings, etc. In view of all these, Washington, he said, is a city of peculiar interest to the engineering profession. He also explained the method of defraying the cost of these improvements, the citizens of Washington paying one-half, the nation the remainder. The speaker made a plea for a larger appropriation for the completion of the development of the city as a national capital worthy of the American people.

President Jesse M. Smith responded for the society, expressing the gratitude of the members for the cordial reception accorded them. Dancing followed.

The session Wednesday will be devoted to conveying of materials and to transmission dynamometers. In the afternoon there will be a visit to Fort Meyer and other points of interest.

HEROULT FURNACE AT SOUTH CHICAGO.

Current was turned on in the new experimental Heroult electric furnace at the South Works of the Illinois Steel Co. on Tuesday. Speaking generally the furnace is of circular horizontal section with a diameter of 12 or 14 feet with a dome top and bottom and mounted so as to tilt like a Jones mixer for the pouring of the metal. Through the top of the furnace are suspended three electrodes, each 16 inches square, and the terminals to which the electrodes connect are so arranged as to permit of the tilting of the furnace. A three phase, 25-cycle alternating current at 110 volts is used. The bottom is covered with a bed of coke. The particular application of this furnace with regard to which experiments are now to be conducted is the removal of phosphorus under the heat of the electric arc following the treatment of the hot metal in the Bessemer converter. Should the electric furnace prove successful in thus removing phosphorus, the discarding of Bessemer plants may be indefinitely postponed.

PROPOSED TIN PLATE PLANT.

Bert J. Ross has resigned as superintendent of the Greer tin mills of the American Sheet & Tin Plate Co., at New Castle, Pa., and has accepted a position with the Jones & Laughlin Steel Co. in connection with the construction of the new steel works and blast furnaces, at Aliquippa, Pa. It is reported that the Jones & Laughlin Steel Co. contemplates the erection of a 30-mill tin plate plant at the Aliquippa works, but an official statement of such a plant is withheld by the company. For several weeks past, roll makers have had a large inquiry for tin mill rolls in connection with the estimating work which has been done on this project.

RECEIVER APPOINTED.

(Special Telegram.)

New York, N. Y., May 5.—Following a suit in equity brought by the Solid Steel Casting Co., of New Jersey, William B. Harvey has been appointed receiver for the Solid Steel Co. of Pennsylvania, the plant of which is located at Chester. Liabilities are reported at about $250,000.

INJUNCTION DISSOLVED.

(Special Telegram.)

New York, N. Y., May 5.—The injunction recently obtained by Lewis Moreau to restrain the reorganization committee of the Southern Steel Co. from proceeding with its plans has been dissolved. This removes the last difficulty in the way of reorganization.

CUSTOMS DECISIONS.

The Circuit Court of Appeals, Massachusetts district, has decided that "iron sand," "diamond grit" and "steel grit" are dutiable at 45 per cent under paragraph 193 for manufactured metal.

The Board of United States General Appraisers rendered the following decisions:

Steel tubes with outer covering of iron wire are dutiable at 35 per cent under paragraph 152. Steel tubes with outer covering of brass wire and copper pipes with outer covering of iron wire are dutiable at 45 per cent under paragraph 193.

The Colorado Fuel & Iron Co. blew out one of its Minnequa stacks April 1.

FOUNDRYMEN INVITED TO MEET IN PITTSBURG.

Formal action in extending an invitation to the American Foundrymen's Association and allied organizations to hold their annual convention in 1911 at Pittsburg was taken at the meeting of the Pittsburg Foundrymen's Association at the Fort Pitt hotel Monday evening, May 3. By a rousing vote the Pittsburg foundrymen passed a motion to unite their efforts in securing the convention for their city. A committee of five members consisting of W. H. McFadden, of Mackintosh, Hemphill & Co., J. S. Seaman, of the Seaman-Sleeth Co., W. B. Robinson, of THE IRON TRADE REVIEW, O. W. Mason, of the Midland Steel Co., and J. S. McCormick, of the J. S. McCormick Co., was named to convey the invitation to the several associations at the Cincinnati convention and have charge of all matters pertaining to bringing the meeting to Pittsburg. Arrangements were made for the distribution at Cincinnati of lapel buttons bearing "Pittsburg 1911" upon them.

Other matters of business taken up include adoption of several changes in the by-laws, one of which changed the annual election of officers from October to June. A nominating committee was appointed to report at the next meeting. In this connection it was stated that the referendum vote on the proposed increase of dues in the American Foundrymen's Association had failed of adoption. The arrangements for the Pittsburg delegation attending the Cincinnati convention in a body, were discussed. Dr. Richard Moldenke, secretary of the American Foundrymen's Association, delivered the address of the evening, touching upon interesting foundry experiments that had lately been conducted in European plants. An interesting discussion followed.

American & British Co.—The American & British Mfg. Co., Providence, R. I., reports total gross earnings for the year of $1,143.113, a loss of $363,525 compared with last year. The net income from operations was $182,686, compared with $373,505 the preceding year. The net surplus added was $98,622, bringing the profit and loss surplus forward to $832,910. According to the annual report, this was the poorest showing made since 1905. No dividends were paid. The amount of bills payable outstanding was reduced to $66,836 from $556,381 in 1907.

OUR FOREIGN COMMERCE.

March Iron and Steel Exports Best in 15 Months With One Exception—Values Well Sustained—Finished Forms Gaining.

Exports of tonnage lines of iron and steel in March made the best record for any month since November, 1907, with the single exception of March a year ago. The March total, 94,922 tons, is 10,000 tons ahead of the preceding February and only 2,000 tons short of March, 1908, which month, as noted, has the record since November, 1907.

The monthly average in 1908 was 80,000 tons, which last March exceeds by 14,000 tons. The monthly average in the best calendar year thus far seen, 1906, was 110,478 tons, and March falls short of this by less than 15 per cent.

The total value of iron and steel exports in March, including the value of the tonnage lines, as well as various manufactures, including hardware, machinery tools, etc., but not agricultural machinery, amounted to $13,874,461, and this also makes a favorable showing, comparing with a monthly average in 1908 of $12,592,760. The gain is 10 per cent, not as much as the gain in weight of the tonnage lines but still making a good showing.

Exports by Months.

Monthly exports of tonnage lines since the beginning of 1907, a year which showed almost as heavy exports as 1906, the banner year, are given in the following table:

TOTAL IRON AND STEEL EXPORTS, GROSS TONS.

	1907.	1908.	1909.
January	102,630	74,353	70,089
February	64,728	81,773	84,860
March	112,787	96,681	94,522
April	132,792	93,522	.....
May	91,543	64,020	.....
June	92,996	69,779	.....
July	122,249	86,806	.....
August	118,792	87,244	.....
September	114,819	76,727	.....
October	123,170	85,668	.....
November	116,308	71,028	.....
December	86,019	77,656	.....
Total	1,301,979	964,266	249,471

The gain in total tonnage exported in March was, as noted, 14 000 tons over the monthly average of 1908. The gains were chiefly in the more finished lines, a favorable feature. Rails showed but a slight gain, while billets and structural material each lost about 1,000 tons. Sheets and plates made the sharp gain of 5,000 tons, as did pipes and fittings, while wire gained 2,000 tons.

Destination of Rail Exports.

The comfortable alignment of the international rail trade is shown in the distribution of our rail exports, as they are confined almost exclusively to the American continent, outside of a fair tonnage to Japan. Until recently there was extremely sharp competition in the international market, and export orders were sought promiscuously by all the rail producing countries. The division of territory has resulted in much more satisfactory prices all around. It is somewhat exhilarating to observe an inference in some discussions on the tariff that foreign producers are eager for an opportunity to try conclusions in the United States market, when it has ceased to be the fashion to seek such contests even in foreign markets. Our rail exports in the nine months ended last March were distributed as follows, the figures indicating gross tons:

UNITED STATES RAIL EXPORTS, NINE MONTHS ENDING MARCH, 1909.

Europe	2,091
British North America	12,826
Central American states and British Honduras	13,840
Mexico	64,637
West Indies and Bermuda	14,335
South America	29,058
Japan	9,031
Other Asia and Oceania	17,454
British Africa	515
All other Africa	488
Total	164,275

These statistics include light rails, which are quite largely exported to Africa, Asia and Oceania.

In the first three months of this year, the United Kingdom exported 144,378 gross tons of rails, almost as large a tonnage as we exported in nine months. These rails were consigned as follows:

BRITISH RAIL EXPORTS, THREE MONTHS ENDING MARCH, 1909.

Sweden	6
Portuguese E. Africa	659
Chile	1,055
Argentine Republic	46,916
British South Africa	723
British India	29,933
Straits Settlement	8,477
Ceylon	6,218
Australia	16,558
New Zealand	4,414
Canada	39
Other countries	29,380
Total	144,378

FAREWELL DINNER TO MR. WUEST.

The friends of Robert Wuest, commissioner of the National Metal Trades Association, tendered him a farewell dinner at the Business Men's Club, Cincinnati, on Thursday evening, April 29. The dinner was under the auspices of the "Stem-Winders," an organization representing members of the Business Men's Club who meet daily at lunch at the same table. W. F. Robertson, of the Robertson Iron & Steel Co., presided as toastmaster. Among those who spoke expressing their regret that Mr. Wuest's office removal to Cleveland should take him away from Cincinnati were Fred A. Geier, of the Cincinnati Milling Machine Co.; B. B. Quillan, of the Cincinnati Planer Co.; Benjamin Sebastian, of the Sebastion Lathe Co.; Henry Dreses, of the Dreses Machine Tool Co.; C. H. M. Atkins, of the Warner Elevator Co.; George Puchta, of the Queen City Supply Co.; John M. Manley, of the Cincinnati Metal Trades Association, and James F. Taylor, of the American Oak Leather Co.

Mr. Taylor, on behalf of the guests, presented Mr. Wuest a silver loving cup in token of the esteem in which he is held by his Cincinnati friends.

The national office of the National Metal Trades Association is now in the New England building, Cleveland.

RAIL MILL AT ENSLEY IDLE.

Birmingham, Ala., May 4.—The belief is expressed that the steel plant at Ensley (Tennessee Coal, Iron & Railroad Co.), will not be shut down very long, that the necessary orders to keep these works in operation will soon be forthcoming and that ere many weeks have passed there will be a better operation than ever before. An authoritative statement from the general offices of the company in the city was to the effect that the plant would not be in operation until the railroads began buying their rails and intimation was given that this was looked for in the near future. The rail mill was shut down this week.

It is announced that the Tennessee company wil blow in two blast furnaces at Bessemer in the next few days and all repair work on furnaces in the city (Alice), and at Ensley, will be rushed.

New Stack at Struthers.—The Struthers Furnace Co., Cleveland, operating the Anna stack at Struthers, O., began blowing out the furnace May 4 in preparation for tearing down the stack. The company has engaged Arthur G. McKee, engineer, to prepare plans for a new, modern stack with a prospective capacity of 400 to 450 tons daily. Unless plans are changed, the new stack will be 83 feet high, with a 21-foot bosh. The company only recently—and at considerable expense—placed in good condition the three blowing engines and they will be retained. A skip hoist will be added. It is expected to blow in the new furnace early in September. In the meantime, the company has closed down its coke ovens at Fairbanks, Pa.

Curtailment of Production Continues.

Curtailment of the pig iron production in April is shown by our blast furnace figures this month. The total production of coke and anthracite pig iron in April was 1,733,653 tons, compared with a production of 1,822,024 tons in March, a decrease of 88,371 tons, or about 4.8 per cent. The production in April is divided, as follows: Merchant iron, 614,125 tons; non-merchant, or steel-making iron, 1,093,521 tons; spiegel and ferro, 26,007 tons. The production of merchant iron shows a decrease from the March production of 45,195 tons, and the non-merchant iron, or steel-making iron production of April shows a decrease of 41,748 tons. The production by months is shown in the following table:

MONTHLY PRODUCTION.

	1909.	1908.	1907.
January	1,787,473	1,043,374	2,194,801
February	1,682,470	1,086,809	2,047,036
March	1,822,024	1,229,856	2,216,709
April	1,733,653	1,155,122	2,226,708
May		1,168,002	2,291,030
June		1,106,300	2,237,420
July		1,228,604	2,253,243
August		1,366,019	2,243,656
September		1,416,252	2,174,148
October		1,573,824	2,359,690
November		1,582,314	1,820,558
December		1,723,664	1,234,733
Total	7,025,620	15,680,140	25,299,732

Going into the comparison by percentages of production with January, February and March, these figures are available: The percentage of the total output possible to be made in April was 54.8, the smallest of any month so far this year, the percentage of possible output in January being 56.3, in February 57.3, and dropping again in March to 56.9. The comparison of daily production for these months bears out in general this comparison. The following table shows a daily production of the various months of last year, compared with those of the present year:

AVERAGE DAILY PRODUCTION.

	1909.	1908.
January	57,654	34,316
February	60,051	37,476
March	58,775	39,672
April	57,788	38,504
May	.....	37,677
June	.....	36,876
July	.....	39,632
August	.....	44,065
September	.....	47,208
October	.....	50,764
November	.....	52,744
December	.....	55,602

The average daily capacity in blast on the last day of April was 57,859.2 tons, compared with 58,378.8 tons in March. This is a decrease from the active capacity in blast on the last day of March of 519.6 tons. A total of 13 stacks was blown out during the month, of which 10 were merchant stacks and three non-merchant stacks; eight stacks were lighted, of which one was a merchant stack, and seven were steel stacks, showing a gain of four steel stacks blown in and a net loss of nine merchant stacks blown out, which thus gives the total of five stacks fewer in blast April 30 than were blowing March 31.

Pennsylvania shows decreases in both merchant and non-merchant iron, while Ohio decreased its production of merchant iron, but increased its production of steel-making iron. The same comparison holds true of Illinois. In the other states and groups noted, the production of both merchant and non-merchant iron has been curtailed, the Colorado group showing the more striking contrast of a loss of about 23,000 tons. The figures all show that the merchant furnaces have suddenly decreased their output faster than the steel-making furnaces.

BLAST FURNACE NOTES.

The Silver Creek Furnace Co. blew out its Rome, Ga., stack April 18.

The Illinois Steel Co. lighted South No. 1 stack April 8, South No. 10 on April 26, and Union No. 4, April 20.

Lackawanna furnace No. 1, at Buffalo, of the Lackawanna Steel Co., was blown in April 24.

The month of April proved the best month in point of production so far in the history of the Harriet stack at Buffalo, of the Wickwire Steel Co.

Bellefont, Pa., stack of the Bellefont Furnace Co was blown out April 21 for repairs.

The E. & G. Brook Iron Co. blew out its Keystone, Pa., stack April 1, which had been operating up to that time.

Marshall stack of the Juniata Furnace & Foundry Co., Newport, Pa., went out of blast April 20.

Perry No. 1 furnace of the Perry Iron Co., Erie, Pa., was lighted April 23, after being out several weeks for repairs.

The Saxton, Pa., stack of Joseph E. Thropp, which had been in operation, was blown out April 17.

The Citico Furnace Co., Chattanooga, Tenn., blew out the Citico furnace April 9, for repairs.

The Roane Iron Co. blew out its No. 1 Rockwood, Tenn., stack April 14.

The West End Furnace Co., Roanoke, Va., blew out the West End stack April 17.

Gayley Blast and Moisture.—A correction should be noted in connection with the article on page 805 of the issue of April 29, describing the charts graphically illustrating the action of the Gayley dry blast system. The scale of grains of moisture is not shown on the charts, the readings of which refer only to the temperature and of the blast. The main purpose of the chart was merely to show the large quantity of moisture removed and the regularity obtained after removal.

APRIL FURNACE REPORT.

STATES	NO. OF STACKS.	NO. IN BLAST ON LAST DAY OF MONTH. APRIL	NO. IN BLAST ON LAST DAY OF MONTH. MAR.	PERCENTAGE OF TOTAL POSSIBLE OUTPUT MADE.	AV. DAILY CAPACITY IN BLAST LAST DAY OF MONTH.	ACTUAL TONNAGE MADE. MERCHANT.	ACTUAL TONNAGE MADE. NON-MERCHANT.	TOTALS. APRIL	TOTALS. MAR.
Pennsylvania	154	93	95	60.8	24,710.1	179,492	548,844	728,336	754,986
Ohio	66	41	41	61.5	12,439.4	125,914	247,464	373,378	378,641
Alabama	46	22	22	47.8	4,666.2	112,966	27,020	139,986	144,873
Virginia	24	11	12	46.4	1,119.8	34,018	———	34,018	28,665
New York	25	12	12	44.1	3,206.4	56,831	31,619	88,450	114,233
New Jersey	9	3	3	33.3	659.7	19,798	———	19,798	19,557
Illinois	25	18	15	64.8	6,442.2	16,805	153,323	170,128	165,011
Tennessee	18	7	9						
West Virginia	4	1	1	37.1	1,184.0	28,788	8,940	37,728	45,959
Kentucky	7	2	2						
Maryland	4	2	2						
Wisconsin	6	4	4						
Colorado	6	2	3	55.0	3,335.2	23,740	76,311	100,051	123,544
Indiana	4	3	4						
Georgia	2	0	1						
Texas	3	0	0						
Minnesota	1	0	0	40.0	438.0	15,773	———	15,773	19,100
Michigan	2	2	2						
Missouri	1	1	1						
Spiegel—All states								9,788	10,488
Ferro—All states								16,219	16,967
Total	406	224	229	54.8	57,859.2	614,125	1,093,521	1,733,653	1,822,024

THE FAIR THAT WILL BE READY

ALASKA-YUKON-PACIFIC EXPOSITION AT SEATTLE, JUNE TO OCTOBER, 1909

Special Facilities for the Exhibition of Machinery and Foundry Appliances—A Model Foundry on the Grounds—Abundant Power—Both Reasonable Rates and Terms.

Nominal rates for floor space, an abundance of electricity, steam and compressed air, a central location, a special department for foundry exhibits, and buildings that will be completed long before the fair opens, are features that will attract exhibitors of machinery, foundry appliances and manufactured products to the Alaska-Yukon-Pacific Exposition. The exposition will be held at Seattle, Wash., from June 1 to Oct. 16, 1909.

Object of the Fair.

The object of the fair is to exploit the resources, opportunities and development of the great Pacific coast territory, including all of the United States west of the Rocky mountains, western Canada, Alaska, Hawaii, Philippine Islands, Japan, China and the Orient. This embraces a territory with the largest fund or untouched natural resources, the greatest percentage of annual growth and the most tremendous potential purchasing power in the world. The west, even if it were bereft of its great natural advantages, will grow more in the next half century than will the other sections of this country, due simply to the economic pressure and expansion of the already filled and occupied areas in the east. The west is now a heavy purchaser of machinery and the volume of its purchases will grow steadily, as it has grown during the past year in spite of the industrial depression. The A. Y. P. exposition at Seattle is therefore a logical, satisfactory and prudent place for a manufacturer of machinery to exhibit his wares; such exhibition cannot but result in a widened market and increased sales. Ample facilities have been provided for the convenience of the exhibitors of machinery and manufactured products.

"The Fair That Will Be Ready."

The fair will be ready *on time.* This is now an assured fact and is a matter of great importance to the exhibitor who wishes to make the most of his opportunity. Other international fairs have failed dismally in this respect; the A. Y. P. management has made a special effort to have the fair ready promptly on the dawn of June 1. The buildings as a whole are now over 90 per cent completed; many of them were finished in 1908 and they will all be done by May 1, 1909. The pavements are laid; the grading is done; the grass plots are sodded and the flower beds are in bloom. Of the four buildings of interest in machinery and iron trade circles, the large manufacturers and liberal arts building is finished and ready for occupancy; the machinery hall has been completed since November, 1908; the power plant will be done before this article is published, while the foundry is 80 per cent completed and will be finished before May 1.

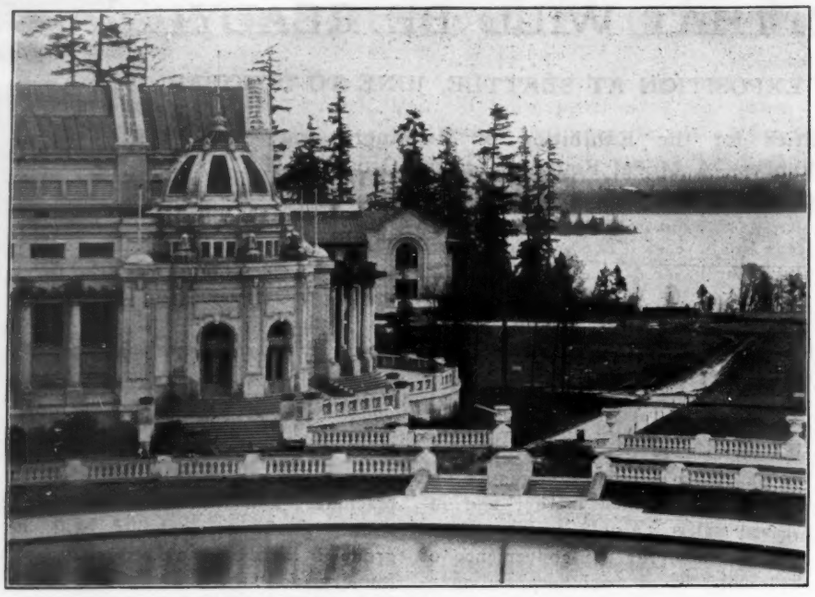
Machinery and Iron Trade Buildings.

The machinery exhibits will be grouped in the machinery hall, the foundry and the main power plant. The exhibits of manufactured articles and processes of manufacture will be in the great manufactures and liberal arts building, opposite the cascades, the central scenic feature of the exposition.

In the manufactures and liberal arts building will be seen can making machinery, sheet metal forming and punching presses, manila and wire rope making machinery and similar devices, all in actual operation. Here also will be exhibited wire products, sheet metal products, shelf hardware, etc. The building is semi-circular in form and contains 60,000 square feet of exhibit space. Power is supplied by electricity and compressed air. The

MANUFACTURES AND LIBERAL ARTS BUILDING.

This photograph, taken early in April, indicates the completed condition of the grounds and buildings 60 days before the exposition will open.



A View From the Exposition Grounds.

The southern end of the Manufactures building is seen at the left. Behind it is seen a corner of the Machinery hall. Photographed Jan. 15, 1909.

building is centrally located facing the cascades; it is of the French renaissance design with circular pergola colonnades and ionic columns supporting trellis beams and flower boxes.

The machinery hall is just back of the manufactures building. It is a permanent structure of terra cotta brick and heavy mill framing, 100 by 250 feet in size. Architecturally it is a modern design of the Spanish renaissance, simple and pleasing in appearance. After the fair this building will be one of the engineering buildings of the University of Washington. The building is well lighted with a double row of windows and an ample skylight. It is furnished with compressed air, with either direct or alternating current electricity of any voltage up to 50,000, and with low and high pressure steam. The hall will contain the exhibits of machine tools, machine shop appliances, engines, boilers, lumbering, mining and wood working machinery. Special attention will be devoted to hoisting and transmission machinery for which there is a large demand in the west.

Model Foundry.

A feature of the mechanical department of the exposition will be the model foundry, which is located immediately adjacent to the machinery hall. This will be the first international fair to exhibit a complete foundry in operation. The organization of this exhibit is due to the co-operation of the exposition management, the University of Washington, and the United Metal Trades Association of the Pacific coast. The foundry is a heavy, slow burning frame building with red brick walls. It is 200 feet long and 100 feet wide divided into a 30-foot central bay and two side bays. The central bay will be spanned by a traveling crane. At the north end is a heavy mezzanine floor 50 x 50 feet in size. Space is provided here for a forge shop and an exhibit of forging machinery. The foundry equipment will consist of a cupola, a brass furnace, a compressed air plant, several types of molding machines, possibly a small steel converter and exhibits of foundry appliances and supplies. After the exposition the foundry will be a part of the engineering equipment of the University of Washington. A complete description of this plant, its exhibits and operation will be presented in a subsequent article in The Iron Trade Review.

Power Plant.

Adjacent to the east side of the foundry is a spur from the Northern Pacific railway, and between this spur and the main line of the Seattle division 170 feet further east, is situated the exposition power plant, housed in a substantial 40 x 85-foot brick structure. The plant contains electrical, pumping and compressed air machinery. It was designed and erected by the Hallidie Machinery Co., Seattle. A complete description of the power plant will appear in another issue of The Iron Trade Review.

Applications for Space.

Space in the buildings is sold to exhibitors at the rate of $1 per square foot for the exposition period. Power is rented at $40 per horsepower for the season. Special concessions are given to exhibitors of foundry equipment and appliances. Applications for space in the manufactures building and machinery hall should be addressed to Henry E. Doesch, director of exhibits and privileges, A. Y. P. E., Seattle. Exhibitors of foundry machinery and supplies should address H. S. Hastings, Commissioner, United Metal Trades Assoc., Seattle, Wash.

Machinery Hall—A. Y. P. Exposition.

This building is of permanent construction and after the fair will be one of the engineering buildings of the University of Washington. The Foundry is just behind the Machinery Hall, the space between the two buildings being about 60 feet.

EMPLOYERS' LIABILITY---A PAPER READ AT THE N. M. T. A. CONVENTION.

"Probable Changes in the Law of the Employers' Liability" was the subject discussed at the recent convention of the National Metal Trades Association by Epaphroditus Peck, lecturer on the law of master and servant in the law department of Yale University. He spoke in part as follows:

One thing is certain: the present state of the law of the employers' liability is satisfactory to no one, unless it may be to the ambulance-chasing type of lawyers. By employers, by labor leaders, by economists, by law teachers, by judges, it has been condemned. The most recent and comprehensive text-writer on the subject says, in his preface, that this subject "may, without any exaggeration, be said to enjoy the unenviable distinction of having been the occasion of a larger number of conflicting doctrines and inconsistent decisions than any other branch of the law."[3]

Lord Cockburn, one of the judges of the highest court of Great Britain, said in a judicial opinion, speaking of the so-called fellow-servant rule, by which an employe cannot recover from his employer for an injury caused by the negligence of a fellow servant: "I have rarely come upon any principle that seems less reconcilable to legal reason. I can conceive some reasons for exempting the employer from liability altogether, but not one for exempting him only when those who act for him injure one of themselves. It rather seems to me that those are the very persons who have the strongest claim for reparation; because they incur danger on his behalf."[4] * * *

The supreme court of errors in Connecticut declared in 1835: "The defense of common employment has little of reason or principle to support it, and the tendency in nearly all jurisdictions is to limit rather than enlarge its range. It must be conceded that it cannot rest on reasons drawn from considerations of justice or of public policy;"[5] * * * and one of the judges of the same court added in 1898: "The evil is too deep-seated to be remedied by judicial action; it needs radical treatment by wise legislation."[6]

Judge Remick of the New Hampshire supreme court made the following remarks in 1902 concerning the same rule of law, which that court was called upon to enforce: "The doctrine has been condemned as unphilosophic by the ablest thinkers, it was never accepted outside of England and America, it has been substantially nullified by legislation in the former, and essentially modified if not abrogated by statute in many of the states of the latter country, * * * and finally where it is still applied, judicial decisions are in hopeless and irreconcilable confusion respecting its application. It is apparent from these observations that no harmonious and consistent doctrine is involved, but an intricate and clumsy state of things against which courts and legislatures are on the move."[7]

Another thing is certain. A body of law concerning which such criticisms are made by the most conservative, impartial and well-informed class of men who have occasion to deal with it, who in fact are compelled to apply and enforce the law while they condemn it, and which provokes a burning sense of injustice in the most numerous class of American voters, is not likely to go long unaltered.

Many Bills Introduced.

I think it is safe to assert, though of course I have not examined the journals of every American legislature, that there has not been a session of an American congress or state legislature in 10 years in which bills have not been introduced for amendment of the law of employers' liability; the president of the United States, the secretary of commerce and labor, the governors of many of our states, have asked for remedial legislation; and nothing shows more strikingly the conservatism of our state legislatures, and their deference to the fears of business interests, than the fact that, while the British parliament has passed, and twice extended, a thoroughgoing measure of employers' liability, and practically every country of Europe except Russia and Turkey have passed statutes dealing with the subject by compulsory insurance, the demand for reform has thus far gone substantially unheeded in the United States.

The state of Colorado alone has abolished the fellow servant rule; a dozen other states have abolished it as to railways, or as to railways and mines; and nearly all the others have passed statutes which codify the former rules and reform them in minor details.

The federal congress has also enacted a substantial reform act, though far less drastic than the British one, which of course applies only to employés in interstate commerce. But the attacks on the vulnerable structure are likely to continue until more complete destruction has been wrought than by the dents and cracks already given.

Let me try to state what I conceive to be the radical fault in the present law on this subject, and what seems to me the probable line of future legislation.

At present a workman's right of action against his employer for an injury received in the course of his employment rests on the theory of the master's negligence; in bringing a suit the man must accuse the master of wrongful neglect in the management of his business; if the injury was a pure accident, if it arose out of the unavoidable risks of the business, if it was imputable to the negligence of some other workman, even (in most states) to the negligence of the injured man's foreman or boss, the employer is not liable.

The primary fact, that the master must be convicted of negligence, or a wrongful act, and a wrongful act not of a subordinate employe, but of the master himself, or of some manager or superintendent who stands in the master's place, a vice-principal as the legal phrase is, tends to put the claim on a hostile footing at once. The injured workman is not asking the master to meet a legitimate and natural expense of the business; he is charging him with a wrongful act, and demanding his punishment by a judgment for damages. Thus the claim becomes an accusation, the request for damages a demand for punishment, and the master naturally feels himself justified in resisting, indeed almost bound to resist. It is evident that it is often very difficult for the workman to prove the master's negligence, even if it exists in fact. The responsible officers of the employer are not likely to admit the

[3]Labatt on Master and Servant, preface, p. vi.
[4]Dixon vs. Rankin, 14 Sc. Sess. Cas., 2d ser., 420, 1 Am. Rway. Cas. 569.
[5]Ziegler vs. Danbury R. Co., 52 Conn. 556.
[6]Note by Judge Hamersley, 70 Conn. 196, 39 Atl. 128.
[7]Remick, J., in McLaine vs. Head & Dowst Co., 71 N. H. 294, 52 Atl. 549.

negligence, which is really their own negligence; and other workmen are naturally timid about testifying against their superintendent and employer.

With the superior resources of the master, and the various lines of defense which the law gives to him, in perhaps nine cases out of 10 the workman's claim is finally defeated; both sides bear heavy costs of litigation, a rankling sore is left to embitter the future relations of master and men, and the workman bears not only the pain and disfigurement of his injury, but also the pecuniary loss, increased by his expenses of suit. In the tenth case the workman wins; and in that case he gets from the sympathy of the jury, and their undefined sense that the master's defense is not a just one, a verdict for much more than he ought to have; and the verdict is doubled to the man who pays it, and halved to the man who receives it, by the costs of litigation.

Victory After a Fight.

In either case what has been accomplished is not a fair and friendly adjustment between man and man of a business loss; but a victory after a fight, in which the defeated party is thoroughly crippled, and the winner is not without some bruises.

Now litigation will undoubtedly occur in adjusting the losses occasioned by accidents, whatever the basis of liability may be; but a system in which the element of hostile accusation was less prominent, in which the liability was made practically certain, the cost of compensation was regarded as a regular and matter-of-course expense of the business, and where there was no uncertain element to be adjusted but the amount of the compensation, would certainly lessen the occasion and necessity for litigation.

The ultimate rule of justice, to which legislation and decision are bound constantly to tend, and which they will some time certainly reach, is to regard the injuries to workingmen in the operation of machinery as an expense of the business, to be charged into the cost of manufacture and imposed upon the customer in the price, as are other expenses of the business.

A certain manufacturing plant has 500 expensive machines of various kinds; it employs a thousand men. In its operation 20 machines require to be replaced and 50 to be repaired every year. Of course, the cost of repairing the machines that are slightly broken, and replacing those that are ruined, is charged to operating expenses. But in the same establishment 10 men are killed or crippled every year, and 25 men receive injuries which cause loss of time and require medical or surgical care. Why should not this also be treated as an expense of the business?

It is, in fact, an expense of the business. The operation of the plant results in a profit to the owners, it benefits the general public by producing the manufactured article at a far less cost than it could be produced for by mere primitive methods, but it has the countervailing disadvantage of constant danger and frequent injury to the limbs and lives of its operatives. It can hardly be the rule of justice that the owners and the public should receive and enjoy the profits of the industry, while its incidental loss in life and health, the other side of the economic balance sheet, should be cast upon the shoulders least able to bear it. It should, as a matter of course, and without accusation of wrong-doing, or unnecessary litigation, enter into the profit and loss account of the business, and so into the cost of the commodity.

This proposition it is hardly possible to deny or to argue against as to injuries arising from the inherent risks of the business, those which occur necessarily and invariably, and without definite fault on any one's part.

Argument Is Clear.

As to those which occur by the fault of some other workman than the one who is injured, the argument is almost equally clear. The employer selected the negligent man, he had the power to watch his work and to discharge him if he proved unfit for his place, the man is working under the owner's commands and to make a profit for him, the owner would be liable to a third party for his negligence in the course of his work, and the rule that he is not equally liable to a fellow-servant is one which requires more special reasoning to explain, still more to justify it. One feels inclined to say with Lord Cockburn that the distinction should be the other way, if any is to be drawn, and that the workman who is in the danger place by the master's employment, working there for the master's profit as well as for his own, has at least as much claim upon him for protection as the mere stranger who comes in contact with the master's negligent servant on his own errand or by mere chance.

But if the injured man has been negligent himself, and the injury is in part or wholly the result of his own negligence, there is at least a plausible argument against the master's liability. It may then be said that the burden of his own fault may justly be left upon his own shoulders, however pardonable the fault may have been, or however crushing the burden, rather than to cast it upon the master who is guilty of no fault.

Even to this, something may be said in reply. In the strain of modern factory work, negligence itself is an invariable and incidental result of the business. Even the most prudent man, coming in contact with a point of danger a hundred times a day, cannot always have his mind intent upon, and his body responsive to, the danger. Very significant statistics have been compiled in Germany showing that the great majority of factory accidents occur during the later hours of the working day, when mind and body are fagged, and incapable of the same sharp attention that they gave earlier in the day. There is a certain unfairness in measuring in cold blood, in the very different atmosphere of the judge's chamber or the jury room, the momentary action of a man in the tumult and fatigue of the factory, and deciding that because the man's attention failed, and his fingers dropped into the dangerous spot, he is to bear the life of a cripple as a just penalty of his fault, without contribution to his loss by the master for whose profit the danger was incurred.

A Touch of Irony.

One argument made in behalf of recovery when the negligence is that of a fellow-servant, when the rule was first formulated 70 years ago, was that the workmen would thereby be more vigilant in caring for general safety, and in observing and checking each other's careless conduct, and that accidents would thereby be lessened. This suggestion, as was said in one of the judicial opinions already quoted, "has a touch of grim irony when read in the light of existing conditions in the employment of labor."

It may well be imagined, rather, that a strict rule of liability of the employer for accidents will lead to greater care in the installment of dangerous machinery, in the weeding out of careless operatives, and in the enforcement of shop rules for the promotion of safety, and so the real burden of loss may be lessened by imposing it upon the party who has the establishment of safe conditions chiefly within his power.

It must be remembered, too, that the workman must always bear the personal suffering, the possible disfigurement, the danger of death; and the workman is surely peculiarly constituted who will expose his body and life more freely to danger because he is assured of a compensation for his pecuniary loss.

Doubtless, also, the general adoption of liability insurance will have the same effect in improving conditions, by leading the insurance experts to suggest improvements to the factory owner, and offer lower rates to secure their adoption, that it has already had in the very similar matter of fire hazard. It is often said that the spread of liability insurance has aggravated the existing evils of the situation between the master and servant by eliminating the personal and human element from their negotiations, and substituting the cold-blooded corporation for the kind master; perhaps in the way that I have indicated liability insurance may ultimately vindicate itself.

In accordance with the theory that I have tried to outline, the rule of the workman's compensation for injuries received in the course of the employment, unless caused by his own serious or wilful misconduct, has been adopted in England in place of the common law liability of the master to pay damages for his culpable negligence. A commission appointed by the Massachusetts legislature, of which Carroll D. Wright was chairman, recommended the adoption of a similar act in Massachusetts in 1904. One feature much emphasized in the English act and in the Massachusetts report is the establishment of a system of arbitration to fix the amount of compensation, and of a rule for measuring the compensation by a fixed ratio to the man's wages, varying with the extent of his disability, and, in the case of death, with the degree of dependence of his surviving relatives upon his earnings. This is expected to greatly lessen litigation, by leaving practically nothing to litigate; the liability being fixed, and the amount of compensation a mere matter of computation.

The provisions of our American constitutions which guarantee trial by jury to all litigants, may create difficulties in following the British act in the first, at least, of these special provisions; but the Massachusetts commission thought them not insuperable. A second Massachusetts commission, appointed in 1907 and reporting in 1908, voted by six to five not to renew the drastic recommendations of the commission of 1904, but did recommend a system of indemnity by special contract. An Illinois commission reported in 1907 a plan for indemnity insurance by contract. A Connecticut commission has just submitted to the legislature of 1909 a most impartial and valuable report, stating very clearly the history and status of the question, but confining themselves to rather conservative recommendations.

Massachusetts did not adopt the recommendations of her commision, and no American state has yet adopted this broad basis of liability. Perhaps none will at present. Our division into 46 separate jurisdictions, each of which must adopt a plan of reform to put it into complete operation, and the natural argument of the employer in each state, that he cannot fairly be subjected to new burdens from which his own competitors in other states are free, make the progress of economic changes slow in America. But a general current of legislation favorable to the workman's side of the question is already in motion, and is likely to increase in volume and force.

I believe that the great majority of American manufacturers desire to do justice as well as to make money; and that they will not desire to obstinately oppose any measure which they are convinced is a measure of right.

PLANS OF THE ALGOMA STEEL CO.

The Algoma Steel Co., which heretofore has been limited to the rolling of rails, is to equip its mills for the production of other steel shapes. This announcement is made by J. Tatnall Lea, of Philadelphia, vice president of the Lake Superior Corporation, in the course of a statement explaining the sale to the Fleming syndicate in London of $1,024,000 of first mortgage collateral trust 40-year 5 per cent gold bonds of this corporation, which had been held in its treasury and were all the bonds thus owned. In addition, the syndicate also purchased the bonds belonging to the Canadian Improvement Co., held by various banks as collateral. This gives the Fleming syndicate a total of over $8,000,000 out of a total issue of $10,000,000.

Buys Canadian Plant.—The Maple Leaf Harvest Tool Works, of Tillsonburg, Ont., has been bought out by the American Fork & Hoe Co., Cleveland, O., controlling many like plants in the United States. The Tillsonburg factory will be devoted to the manufacture of goods for export, and it is intended to increase its capacity fourfold. C. K. Jansen, secretary-treasurer of the old company, retains his interest and will have the management of the Tillsonburg plant.

The annual meeting of the Pennsylvania Steel Co. will be held May 10 at Camden, N. J.

LOW PRICES

For Structural Steel in America Astonish Great Britain.

Office of THE IRON TRADE REVIEW,
Prince's Chambers, Corporation St.,
Birmingham, Eng., April 14.

The news contained in THE IRON TRADE REVIEW cablegram to the effect that structural material was being sold by American producers at a little above $20 per ton on large contracts caused some sensation among British structural engineers.

It may be explained that THE IRON TRADE REVIEW cablegram, which is forwarded weekly, is published in a large number of daily newspapers in Great Britain, especially in the iron districts, and the news therein contained is always eagerly scanned by British steelmakers. The Birmingham representative of THE IRON TRADE REVIEW, in conversation with the manager of one of the largest firms of structural engineers, learned the true significance of this cheap line to British houses. So low a figure was regarded with great astonishment, representing a fall considerably below any British minimum recorded. The lowest price known to have been paid for steel was £4-12s-6d some years ago, and this was by no means up to average quality.

In regard to the question whether such cheap steel might not become a competitor in Great Britain, the engineer stated that the question of foreign supplies is not one altogether of price but depends much more upon prompt delivery. Owners of property, builders of warehouses, are gradually getting into the way of delaying their orders until they are quite ready to execute. Structural material is not stored, but is brought direct from the steel mill and dumped on the scene of building operations practically at the moment when it is wanted. To meet this demand British engineers are informed by various steelmakers as to the particular shape or section they are likely to be rolling and they place their orders accordingly from week to week. The urgency for prompt delivery would largely be a barrier in the way to the use of American steel for general structural purposes.

The case is different with regard to shipbuilding, and it is quite likely that Belfast ship builders who order various descriptions of iron in lots of a thousand tons at a time, would very likely be tempted by a prospect of purchasing cheap material. At all events it may be taken as certain that they are paying consider-

ably more than $20 per ton and the real question is whether, with the addition of freight charges, the American material would get sufficiently below the British article to make it worth while on the part of shipbuilders to purchase. On that point it might be worth while for American steel makers to institute inquiries.

A very substantial naval contract has found its way to the hands of British firms from Spain. The Spanish government is building a fleet of battleships, the total of which will run into five millions, and the contract has been settled in favor of the British group comprising Vickers, Sons & Maxim, John Brown & Co., and Armstrong Whitworth & Co. There is an arrangement by which the building will be carried out in Spain, but the material will be British and the workmen will be recruited largely from the home works, while a good deal of the manufactured material will be prepared at the various provincial centers of the firms. Much preliminary work has to be done at Farrel and Carthagena in the way of preparing the yards before the actual work of shipbuilding begins and this work will commence at once.

In every direction, there are signs of improvement. The board of trade returns are better, and unemployment is also less severe. For instance, the Birmingham City Aid Society, which in January had 355 applicants for work, last week had only 38. This is partly due to better weather, but it is also due to better employment in several trades, such as the cycle trade and various metal trades. The board of trade returns show that makers of galvanized sheets did remarkably well during March, exporting to the value of £622,683, or £193,251 more than the corresponding month of 1908. Practically all the foreign markets show improvement, and in particular the South American markets are decidedly better.

Some concern has been caused by the success of Germany in securing rather desirable steel orders, but it is hoped that this successful competition will be temporary in view of the better reports which are coming from Germany.

The meeting of the Appalachian Engineering Association will be held May 7 at Roanoke, Va. Among those who will deliver addresses are Thomas L. Watson, state geologist of Virginia; Captain Baird Halberstadt, Dr. Frank A. Wilder, former state geologist of Iowa, and Major William N. Page, of the Virginian railway.

EIGHT HUNDRED OVENS

Will be Built by Isabella-Connellsville Coke Co.—May Consolidate.

The recently organized Isabella-Connellsville Coke Co. of West Virginia, which holds extensive coking coal rights in Luzerne township, Fayette county, Pa., has decided to appropriate $2,000,000 for immediate construction work. The plans, which are to be carried out by Jan. 1, 1910, contemplate the sinking of two shafts and the erection of two coke plants of 800 ovens each. J. C. Brydon of New York is president of the company. In this connection, negotiations are now pending for a consolidation of the Isabella company with the Tower Hill-Connellsville Coke Co., which, if consummated, will mean the merger of about 5,000 acres of coking coal land and, including the immediate construction plans of the former company, would cover the operations of about 2,100 ovens. Geo. D. Howell of Uniontown, Pa., is president of the Tower Hill company. John S. Kuhn of Pittsburg is mentioned as a probable head of the new corporation in the event present plans are carried out. The proposed consolidation, it is stated, is a step in the undertaking now being advanced for the general combination of the independent coke plants in the main Connellsville basins.

BOUNTIES MAY CEASE

Shortly, According to Intimations of Canadian Finance Minister.

Toronto, Can., May 1.—Hon. W. S. Fielding, Canadian finance minister, delivered his annual budget speech on the 20th ult. No changes in the tariff were announced, but it was intimated that the bounties on iron and steel might cease at the end of the coming year. Should this course be adopted there will be a strong agitation among iron and steel producers for an increased tariff on pig iron and other products. The failure of the tin plate manufacturers to secure recognition was generally anticipated, as their demand for tariff protection was actively opposed by the canners and other interests.

Premier Hazen, of New Brunswick, has introduced in the provincial legislature a bill to provide for the development of the iron ore deposits near Great Falls in Gloucester county, N. B., considered by experts one of the valuable deposits of iron ore of America. It is situated about 26 miles from Bathurst and 19 miles from the nearest point on the Intercolonial Railway. It is proposed to assist the Canada Iron Corporation to develop the mine by guaranteeing their bonds for the construction of a railway to Bathurst or some point on the Intercolonial. Eventually it is proposed to establish smelting works in Gloucester county.

The Ontario provincial government has issued an order-in-council throwing open to prospectors an area of 1,439,300 acres, lying to the North of Sault Ste. Marie in the Algoma district. The territory was set aside about five years ago as a land grant to the Algoma Central & Hudson Bay Railway, and has not been open for general prospecting. It is believed to be rich in minerals, but under the terms of the grant all iron, coal, iron pyrites or nickel discoveries belong to the railway, which is a subsidiary of the Lake Superior Corporation.

T. J. Drummond, of Montreal, is negotiating with the municipal authorities of Fort William, Ont., with a view to the establishment at that point of an extensive wire plant and car factory which will employ 1,000 men at the start.

WILL MAKE RADIATORS.

Birmingham, Ala., May 1.—Officials of the American Radiator Co., headquarters in Chicago, are in Birmingham, closing the deal whereby the Radiator company takes hold of the plant of the Birmingham Pipe & Casting Co. and transforms it into a radiator works. Contracts have been let for the work necessary to be done in the plant here. It will not be long now before a radiator plant will be in operation. It is understood that the plant will be the nucleus of a large works for this district. Notice has been given to the secretary of state of the company's intentions of doing business in Alabama.

Texas Depot Project.—Texas buyers of pig iron are negotiating for establishing a central depot from which pig iron will be distributed to the various foundries throughout the state. A plan formulated by a commission of which Mr. Greenwood is chairman, contemplates the concentration of orders for 30 or 90 days' supply of pig iron from Alabama, making the chartering of a single ship to carry the entire supply possible and obviating proportionately large freight and transfer charges at Galveston, which had to be met formerly by smaller shipments. Several points near Clinton are under advisement, and a location near this port may be chosen because of the distributing facilities.

LABOR'S INTEREST

CONSIDERED BY THE SENATE FINANCE COMMITTEE

In Fixing Tariff Rates of the Metal Schedule—Structural Clause May be Modified.

Washington, D. C., May 1.—Many items of the iron and steel schedule were passed over by the senate on the first reading of the bill in that body, and are to be perfected in connection with the controverted items upon which the senate finance committee has devoted much time, namely coal, hides, lumber, etc., as well as the administrative sections covering the maximum and minimum plan, the drawback clause, etc.

Closer scrutiny of the iron and steel schedule develops the fact that the senate finance committee has deliberately planned, in all the framework of the new schedules, compared with the bill as it was reported from the ways and means committee and as it passed the house, to make substantial increases in duties on all the higher grades of finished iron and steel products. This is the explanation given by the finance committee members for the changes made in the items about which complaint has been made relating to structural steel, billets and bars, and some higher grades of steel forgings; in fact, running throughout the numerous items of the schedule. It is not unlikely that in these changes some errors have been made, as may be shown with respect to the case of paragraph 121 of the new bill, covering anchors and forgings of iron and steel, wherein under new language incorporated into the item by the senate committee, is imposed upon steel fully machined, tooled or otherwise advanced beyond the forging process, a rate 10 per cent higher than is imposed upon this class of finished steel by the existing Dingley law. That is precisely what has been done in many items of the bill except that the advanced rates above the Payne bill merely carry the new rates, as proposed by the finance committee, up to approximately the Dingley law rates.

For Benefit of Labor.

The justification for these advances in rates is frankly avowed by the senate committee members to be that it is their purpose to transfer to this country, to the greatest possible extent, all the labor necessary to be done on the higher grades of finished steel.

It should also be borne in mind, in considering the equivalent ad valorem rates of duty under the existing law, and the comparison of rates proposed by the house bill and the senate bill, that the equivalents are based upon values of different years. The house bill values were based upon the importations of 1906. The senate bill rates are based upon the importations of 1907, with whatever changes in the values of iron and steel imports occurred during the latter year, compared with the former year. As has been shown in the case of structural steel, which the senate bill left at the reduced rate of four-tenths of a cent per pound, as compared with five-tenths of a cent in the existing law, the changed phraseology of the senate bill eliminated and carried into the "basket clause" all "assembled, manufactured, or advanced" structural steel, to a rate of 45 per cent. That is a rate 9 per cent higher than the existing law upon all grades of even assembled and advanced structural steel.

In other words, the senate bill gives the equivalent ad valorem rate on the importation of structural steel in 1907 at approximately 37 per cent. The senate rate is given an equivalent of approximately 30 per cent. Whether the 30 per cent rate on unfinished structural steel is too high, compared with other items in the bill, is to be determined during the consideration of the bill in the senate. Whether the rate on completely finished and assembled structural steel should be left at the Dingley law rate, or carried to the 45 per cent rate, is also to be determined, but the latter rate is supported by finance committee members who insist that it is their purpose to impose the 45 per cent rate, or approximately the average ad valorem rate on what is termed the "luxuries" of the metal schedule.

Billets and Bars.

Similar complaint has been made with respect to the item of the bill covering ingots, billets and merchant bars. It is asserted that under the lower valuation fixed by the senate bill on these grades of steel, namely, running from three-quarters of a cent a pound or less up to 1.8 cents per pound, all new valuations are given rates of duty from seven-fortieths to five-tenths of a cent per pound under the senate bill, as against three-tenths of a cent up to five-tenths of a cent under existing law. The criticism made of this provision of the senate bill is that it is no reduction whatever, because, it is claimed, no steel billets are imported at values so low as three-quarters of a cent per pound; in other words, that the three-tenths of a cent per pound rate imposed by the present law, and retained in the senate bill, will attach to all ingots, billets and bars imported. Based on the importations of 1907, this claim would seem to be substantiated, as practically all the cheaper grades of billets imported carried valuations of 1 cent up to 1.4 cent per pound, at which valuations more than 15,000,000 pounds were imported during that year. The next highest importations were represented by such forms of steel as blocks or blanks, gun barrel molds, and iron-molded steel castings, valued at from 7 to 10 cents a pound, at which valuations about 13,000,000 pounds were imported.

The General Average.

The senate finance committee has not made an explanation of this lowering of the valuations. As a matter of fact, however, it appears that the general average of the equivalent ad valorem rates covering this class of steel, which is reduced from 2 to 7 per cent, according to the different valuations of the imports in 1907, appear to be actually retained at the Dingley law rates, at least upon such steel bars as shall be imported at approximately a valuation of 1 cent per pound.

As has been said, running throughout the entire iron and steel schedule, the senate committee has incorporated changes in phraseology and additions of words intended to impose higher rates of duty upon all the highest grades of iron and steel manufactures. The reductions in the bill are generally upon the lower grades, and yet even the increases that are represented in the openly stated advanced rates, nullify to a large extent the general reductions, from which fact come the figures given in the comparisons of the house bill, as reported by the senate committee, with the present tariff law, based upon the equivalent ad valorem rates of duty on the imports of 1907, applying the rates of the existing law as compared with the rates of the senate bill.

As illustrating how these changes in the equivalent ad valorem rates are made, and how fully they have been worked out by the experts of the committee, it is shown that the average ad valorem rate under ex-

isting law of the steel importations in 1907, given at 32.65 per cent, is given at 31.70 per cent as the average rate on the same importations under the duties imposed by the finance committee bill. The committee experts also show in this comparison what are arbitrarily termed the "luxuries" or "articles of voluntary use" carried in the metal schedule, with rates equalling 42.82 per cent under existing law, to have been increased by the senate bill to 44.16 per cent. The rates on necessary articles in the metal schedule are, by the same estimated figures, placed at 31.28 per cent under existing law, and 30.03 per cent by the senate bill.

ARTHUR J. DODGE.

WILL MINE ORE IN GEORGIA.

Iron ore mining is to be carried on quite extensively in Bartow county, Georgia, by the Pittsburg-Bartow Mining & Mfg. Co., of Pittsburg, which has recently been chartered under New Jersey laws with a capital of $125,000. The company controls a tract of 600 acres of ore land and has practically completed the necessary construction work for active mining, including that of a tipple and sidings and the installation of loading and mining machinery. The plant has also been equipped with pumps and pipe lines, as the ore is such that some washing is required. The mine will be of the open-pit class. The work of putting the property upon an operating basis has so progressed that the company expects to be shipping ore about the middle of May. For the present the company will sell its product as merchant ore to southern furnaces, but eventually other manufacturing operations are expected to be carried on. Thorough soundings and investigations of the deposits have been made and these show that a large block of ore is in sight. The mine is located in a proven district of non-Bessemer ores and is about a mile distant from active operations of the Tennessee Coal, Iron & Railroad Co. Geo. M. Koehnline, Wheeling, W. Va., is president and general manager of the company, and Walter Kennedy, Pittsburg, is serving as consulting engineer.

The creditors' committee of the South Baltimore Steel Car & Foundry Co. has declared the reorganization plan of Jan. 7 effective. This provides for a new stock issue of $1,500,000, of which $1,250,000 is to be taken by creditors in full settlement of claims.

SHARP CONTRAST

Presented by International Harvester Co. With Other Concerns in 1908.

Strikingly in contrast with those surrounding other iron and steel industries in the past year were conditions reported by the International Harvester Co., reflecting the prosperity of the farmer. The total sales noted in the annual report for the year ended Dec. 31, 1908, amounted to $72,541,771, compared with $78,206,890 the preceding year. The following summary of earnings compares with the previous year:

Net earnings	$12,930,378	Inc.	$1,702,060
Deductions	3,169,023	Inc.	1,161,202
Balance	$9,761,355	Inc.	$540,858
Interest on loans, etc.	875,673	Dec.	264,300
Balance	$8,885,682	Inc.	$805,224
Preferred dividends	4,200,000		
Surplus	$4,685,682	Inc.	$805,224
Previous surplus	12,006,308	Inc.	3,880,458
Total surplus	$16,691,990	Inc.	$4,685,682

President Cyrus H. McCormick holds that the earnings were maintained largely through careful economies in manufacture and distribution, and by a material lessening of interest charges. No reduction was made in the wages of employes, the average per capita being greater than in 1907 or any preceding year. He further says: "There seems to be a general change in sentiment upon the 'trust question' in favor of dealing with the large corporations according to their conduct and methods rather than by attempting to destroy them indiscriminately because of their size. The company asserts in this report that it has invited the fullest examination of its business methods and its treatment of competitors and customers."

The company reduced its current liabilities from $19,509,412 to $14,066,052, a net decrease of $5,443,360. The company continued its liberal policy of providing for the future and spent $1,839,844 for maintenance and repairs of plant and $743,557 for experiments, patents, etc., to increase the efficiency and durability of the implements manufactured. Of its bills and accounts receivable, $36,311,230 were in farmers' and agents' notes and accounts and $17,687,056 in raw materials and finished products.

An effort is being made to establish a mining exchange at Duluth, which is said to be a revival of the old mining exchange in which iron ore stocks were dealt some years ago.

OBITUARY.

David Roberts, formerly vice president of the Tennessee Coal, Iron & Railroad Co., and a retired capitalist, died April 16 at Birmingham, Ala., of pneumonia, aged 63.

Jesse Walrath, for three years consulting engineer with Edwin Reynolds of the Allis-Chalmers Co., and for many years general superintendent of the J. I. Case Threshing Machine Co., of Racine, Wis., died April 18, at his home in Racine, aged 71. He was one of the best known mechanical engineers of the west.

Charles F. McCullough, for 15 years treasurer of the Western Tube Co., at Kewanee, Ill., prior to its absorption by the National Tube Co. a year ago in January, died unexpectedly April 25, of apoplexy. Mr. McCullough retired from business at the time the Western Tube Co. was taken over.

Nathan Pratt Towne, chief engineer of the Wm. Cramp & Sons Ship & Engine Building Co., and formerly an engineer in the United States navy, died at Philadelphia April 23 after a prolonged illness. He aided largely in designing and building all the battleships, cruisers and other large vessels built at Cramp's. He served with distinction through the Civil war.

Charles E. Sutton, president of the C. E. Sutton Co., Toledo, O., died April 15 at El Paso, Tex., where he had gone in the hope of regaining his health. He began his active business career in Defiance, O., where he was connected with the Turnbull Wagon Co., and in 1888 he removed to Toledo to assume the management of the Merrill Mfg. Co. In 1902 he became manager of the Caldwell Furnace Foundry Co., formerly the Smead company, and in 1903 organized the Sutton company to take over the Caldwell company.

Loughley L. Sagendorph, pioneer manufacturer of steel sheets, died April 13 at his home in Philadelphia, aged 67. Under patents of which he had 70 registered in this country and a number in foreign countries, he established a number of plants in the east and middle west. First he established in Cincinnati the Sagendorph Corrugating Co. in 1869 but since 1885 he confined his activities to the east. He was president of the American Metal Stamping Co., the Enameled Art Metal Co., of Germantown, Pa., the Penn Metal Ceiling & Roofing Co., of Philadelphia and Boston, and the New York Roofing & Corrugating Co., of Jersey City.

AMONG MACHINERY MAKERS.

NEW YORK.

Moderate Improvement Continues—Panama Lettings.

Office of THE IRON TRADE REVIEW,
Room 1005, No. 90 West St., May 4.

The local machinery market presents no new features of importance. The moderate rate of improvement continues in the main, with now and then a week or two of unusual quiet and occasionally a spurt of business which brings up the average to its usual figure. Buying is still practically all for replacement purposes, and it is rarely that a live inquiry develops for an entire plant equipment of any size. The makers of automobiles and accessories are still among the most active purchasers, but the bulk of their business has already been placed.

Considerable interest attaches to the lettings by the Isthmian Canal Commission on May 12 and 24 for miscellaneous supplies. The newly adopted policy of the commission, as of several other governmental departments, is to purchase yearly supplies at one time. This resulted a few days ago in the placing of very large orders for steel products and railway supplies. The May 12 letting will cover a wide range, but the list includes a considerable number of small tools in addition to various staple iron and steel articles. The later letting will include pneumatic hoists, pumps, pipe-threading and wood-working machines, orange-peel buckets and a considerable quantity of forgings and castings. The commission's early purchases of general machine tools were so extensive, however, that present requirements do not aggregate any considerable figure.

The trade is receiving a good many inquiries for sugar plantation and mill equipment, most of which will probably not be closed until some time during the summer. It is reported that during the past week inquiries have been circulated for close to 600 industrial cars for plantation use, many of them being of large capacity. The Mesta Machine Co., through its local office, recently booked some attractive gear orders for sugar mill installation.

Considerable activity is noted among eastern iron and steel manufacturing interests in the way of plant enlargement and improvement. The E. & G. Brooke Iron Co., Birdsboro, Pa., has decided to erect a new blast furnace in place of its No. 3 stack and has retained Frank C. Roberts & Co., Philadelphia, as engineers. This same engineering firm is looking after extensive improvements now being made at the plant of the Reading Iron Co., Reading, Pa. Secaucus furnace of the Hudson Iron Co., 100 Broadway, New York, is being rebuilt for a greatly enlarged capacity. Before the end of the year it is more than possible that several open-hearth furnaces may be added to the plant of the Maryland Steel Co., Sparrows Point, Md., better to avail itself of the Spanish-American Iron Ore Co. development work in Cuba. A plant for the treatment of this ore by mechanical means has just been completed at Sparrows Point and the Empire Steel & Iron Co. has also recently begun operations with a new concentrating plant at Mt. Hope, N. J. Henry Disston & Sons, Inc., Philadelphia, have closed contracts for the erection of a large warehouse, pattern shop and blacksmith shop at Tacony saw works. One or two other steel plants in the eastern district are understood to be considering important improvements.

The Virginia Bridge & Iron Co., Roanoke, Va., has acquired a tract of land at Memphis, Tenn., where it is planning to erect bridge and structural steel shop at a cost of about $150,000.

The Davison Chemical Co., principal offices of which are at Baltimore, Md., has floated a $300,000 bond issue and will proceed immediately with the construction of a sulphuric acid plant at Curtis Bay. It is possible that the project will ultimately involve the expenditure of twice that amount.

The Crocker-Wheeler Co., Ampere, N. J., notes the sale of 230-volt direct current motors aggregating 235 horsepower to the Spanish-American Iron Co., for installation at Felton, Nipe Bay, Cuba. The Morgan Engineering Co., Alliance, O., has ordered direct current motors with a total of 135 horsepower. The Crocker-Wheeler Co. also reports the sale of several large generators and a number of smaller motors.

The Central Foundry Co., 37 Wall street, New York City, has resumed the manufacture of pipe at its southern plant which was recently destroyed by fire. To resume on this date meant to establish a new speed record in construction work, as it was just three weeks from the time the first timbers were raised until the completion of the main foundry building, 120 x 500 feet, a cleaning room, 46 x 90 feet, and a cupola house, 60 x 85 feet. As fast as the buildings were completed the equipment was put in place, and the entire work was finished within the estimated time.

MILWAUKEE.

Heavy Machinery Builders Steadily Increase Forces of Workmen.

Milwaukee, Wis., May 3.—That business is improving with the larger machinery manufacturing plants of Milwaukee is evidenced by the fact that working forces are gradually being increased. Figures from 12 of the large manufacturing plants show that while they normally employ about 12,365 people, they now have working 11,820, or within 545 of the normal contingent. Among these 12 concerns which are meeting with better business and where indications are that more employes will be taken on soon are the Pawling & Harnischfeger Co., the Filer & Stowell Co., the Nordberg Mfg. Co., the Geuder, Paeschke & Frey Co., the Kieckhefer Elevator Co., the Milwaukee Harvester Works, the A. J. Lindemann-Hoverson Co., the Vilter Mfg. Co., and the West Milwaukee shops of the Chicago, Milwaukee & St. Paul Railway Co. It has been announced by A. E. Manchester, superintendent of motive power at the Milwaukee road shops that there are contracts enough ahead to keep the full force of more than 4,000 men busy for the next three months. Locomotives and cars for the Pacific extension of the road are still being turned out.

The Sight Feed Oil Pump Co., of Milwaukee, will soon erect a new and modern plant on Reservoir avenue. The factory will be one-story, of brick construction, with concrete foundation and saw-tooth roof. The new plant will be equipped with the machinery of the present establishment together with much new equipment.

Several improvements are being made at the plant of the La Crosse Plow Co., at La Crosse, Wis., including the construction of a $1,500 platform around the Third and Pine street building.

Lloyd D. Freeland and H. Van Epps, of Sturgis, Mich., manufacturers of steel tanks, boilers and heaters were at Watertown, Wis., recently negotiating for establishing their plant at that city. Portage, Wis., is also being considered as a location.

Three new industries have become located at Eau Claire, Wis., within the last few months including the Bark River Bridge & Culvert Co., formerly

of Bark River, Mich., manufacturers of the American ingot iron road culvert; the Sheet Metal Works of John Beernink, and the recently installed plant of J. Herbert Johnson, formerly of Milwaukee, where brass work and aluminum goods will be turned out. The remodeled shops of Mr. Johnson are fast nearing completion.

One of the largest filtering plants in the world is being erected by the Pfister & Vogel Leather Co., of Milwaukee. The apparatus to be installed at the Milwaukee plant will be 45 feet in diameter and the roof will be 90 feet from the ground. It will soften and purify 150,000 gallons of water per hour or 360,000,000 gallons daily. The plant is being erected by the Cass L. Kennicott Co., Chicago.

CINCINNATI.

Past Month Was Disappointing in Volume of Business.

Office of THE IRON TRADE REVIEW, First National Bank Bldg., May 4.

The month of April in the machine tool industry in this center has apparently disappointed expectations as to volume of business in this line. There was a gradual increase in orders since the first of the year through the first three months, but April has hardly equalled the March record and to this extent the business has been unsatisfactory. The shops are mainly depending for orders upon business that is coming in from day to day and there is nothing upon which to base calculations for future operations. It is noticeable that some of the plants which were dull last month have had improved business this month, while those that were fairly well satisfied during March have not been able to make favorable reports on their April business; in other words, there does not seem to be enough business to go around and keep the shops comfortably busy. In spite of the reduced number of operatives, there is almost a scarcity of good machinists in this center, as automobile manufacturers are taking the machinists and actually paying more for their services than the machine tool plants. A resumption of railroad buying is regarded as essential to stimulate machine tool activities, and this source of demand appears to be lacking. Foreign trade has improved slightly, but not sufficiently to be regarded as a feature. It seems to be conceded that the present conditions represent activities at about 40 per cent of normal as against a possible 30 per cent a year ago. The 10 per cent increase, while encouraging, is disappointing, as the general expectation following the election was that 1909 ought to average an increase in business in machine tools which might be represented by 60 to 75 per cent of normal. The failure to realize this hope is perhaps responsible for the feeling of dissatisfaction now prevailing, and furnishes ground for the manufacturer to view the future with less optimism. There is considerable scattered inquiry, but buyers are finding that salesmen are energetically seeking orders and this makes the closing of deals somewhat slow. Prices are regarded as well maintained, as manutacturers in this center take the view that the buyer will select the machine he wants regardless of price; if the purchaser is seeking a cheap machine, it can be found, but if he wants a high grade, efficient tool, he will pay the price.

Philip Fosdic, of the Cincinnati Chuck Co., and R. K. LeBlond, of the R. K. LeBlond Machine Tool Co., returned this week from a Mediterranean tour.

The office of John M. Manley, secretary of the Cincinnati branch of the National Metal Trades Association, will be moved this week from the Seventh street side of the Odd Fellows' Temple building to the Elm street side.

PITTSBURG.

Considerable Activity in Estimating on New Projects.

Office of THE IRON TRADE REVIEW, 510 Park Bldg., May 4.

Engineers and machinery makers report considerable activity in the way of estimating and in the working out of preliminary details for a number of new plant propositions. Some of these undertakings are likely to reach a definite stage within the next several months, subject to a general improvement in business conditions. While the machinery market as a whole exhibits more life, it is still lacking consistent progress in some lines. Manufacturers are expressing the belief that if the greater activity in finished iron and steel material is sustained, an increased buying volume in machinery will result.

The railroads are making heavier purchases of the smaller and less expensive classes of equipment, such as pneumatic tools, but are still displaying very modest needs in machine tools. A number of iron and steel finishing mill projects continue before sellers.

One of the most active projects involving the purchase of considerable rolling equipment and other machinery, now before manufacturers is that of the proposed new tin mill to be erected at Holliday's Cove, W. Va., by the Phillips Sheet & Tin Plate Co., Clarksburg, W. Va. Bids were asked the past week on the steel and other structural material for the buildings. No announcement of the award of the mills, consisting of eight hot and 12 cold mills has yet been made. E. W. Mudge, Pittsburg, is chairman of the board.

The report that the United States Steel Corporation has settled upon Universal, Pa., as the site for the new plant which is to be built to manufacture the Slick steel wheel, is not confirmed by Pittsburg officials. At the present time, the Slick wheel is being made at the Homestead works of the Carnegie Steel Co., and as the demand for it is developed it is proposed to erect a new plant in this district. It is likely to be located near the Homestead plant where the Howard axle works are operated. The new process for manufacturing steel wheels is the invention of Chief Engineer Edward Slick, of the Carnegie Steel Co.

The New Castle Portland Cement Co. is putting the finishing touches upon its extensive new plant erected at New Castle, Pa., for the manufacture of Portland cement, and operations are about to be inaugurated.

Considerable new steam turbine business is being placed with the Westinghouse Machine Co., East Pittsburg, Pa. Among the recent orders received are for two 2,000-horsepower machines for the Dartmouth Mfg. Co., New Bedford, Mass., and one of 1,200 horsepower capacity for the Fort Worth Light & Power Co., Fort Worth, Texas.

Jos. T. Ryerson & Sons, Chicago, have purchased the equipment of the plant of the Pittsburg Steel Construction Co. at Economy, Pa., and have disposed of it to the trade. The Pittsburg Steel Construction Co., as previously announced, is winding up its affairs and its former plant is being converted into a merchant pipe mill, which will be operated by the Central Tube Co., a new corporation.

No figures for the mill equipment for the new plant of the Inter-Ocean Steel Co. to be erected in the Chicago district have yet been asked. At the present time, Julian Kennedy, Pittsburg, engineer for the new works, is taking bids on the general construction contract.

NEWARK GEAR CUTTER GRINDING MACHINE.

The new gear cutter grinding machine, illustrated by the accompanying half-tone, Fig. 1, has been designed by the Newark Gear Cutting Machine Co., Newark, N. J., with the firm intention of placing a machine on the market for this work which would combine simplicity and accuracy in operation and which is always set up for grinding gear cutters. The cutter to be ground is mounted on the fixed stud, A, which is ⅞-inch diameter; when cutters with larger holes are ground, bushes are used, of which a complete set is part of the regular equipment. The table in which this stud is fixed is adjustable parallel to the axis of the grinding wheel spindle, to set the edge of the wheel in line with the center of the cutter stud. The stand B upon which the table is mounted, is adjustable upon a horizontal trunnion, C, thus providing means to tilt the table up or down. This adjustment allows heavy pitch gear cutters to be ground in the two corners between the teeth, as in Fig. 2, without changing the wheel or removing the cutter from the stud; it also affords means of instantly adjusting the cutter central with the wheel, to suit the different thicknesses of cutters. The machine will take cutters from 1¾ inches up to 8 inches diameter. On most work the tilting table is used horizontal or nearly so.

There is a pawl upon the table, which is adjusted to touch the back of the tooth to be ground; and after once being set, the cutter can be rotated from tooth to tooth. After grinding once around, the pawl is adjusted by means of a screw to slightly rotate the cutter, so that another cut may be taken. This adjustment, which is the "feed," is thus always radial after the cutter is once set, and this is a very valuable feature. It will be noticed that no dials are used for the indexing, but that the pawl operates on the backs of the teeth of the cutter itself. The original accuracy of the cutter is maintained throughout its life.

By reason of the simple indexing means, it is not necessary to count the number of teeth in the cutter, nor to select the proper dial for that number. As the machine has few parts, it is not liable to wear out of alignment; and this is important in a grinding machine.

The grinding wheel is 8 inches diameter with a 1-inch hole, and is of dished form. It is mounted upon a hardened and ground spindle. The

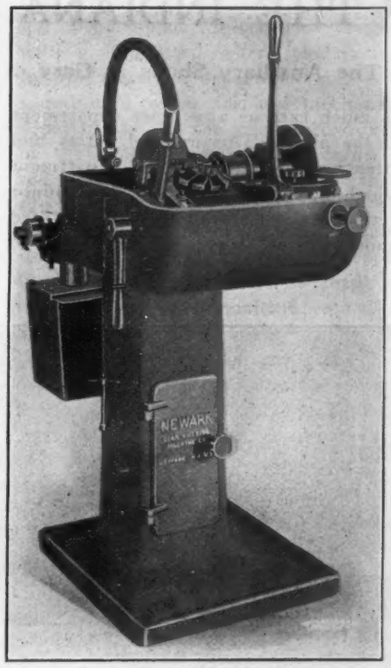


FIG. 1—NEWARK GEAR CUTTER GRINDER.

spindle bearings are of phosphor bronze, adjustable for wear. The end of the spindle outside of the water basin is used as a hand tool grinder, and can use up the wheels after they are worn too small for gear cutter grinding. A hand rest is provided for the outer spindle end.

The grinding wheel spindle is mounted upon a carriage, operated by the vertical lever. This gives the grinding stroke. An adjustable stop regulates the depth to be ground.

The water used to cool the cutter while it is being ground is supplied by a centrifugal pump, supported at the rear of the column. The grinding dust is separated from the water by means of baffle plates. Water does not remain in the large basin, but flows down to a reservoir at the side of the pump.

Many conveniences are embodied in this machine, such as the use of fixed handles wherever possible, to avoid the use of wrenches, and this affords opportunity for quick operation. Where wrenches are required, they are secured to the column by means of a chain, to prevent them from being lost or taken away for other uses. These points were worked out in the Newark company's factory, where the machine was developed as a necessity for the company's own use before being placed upon the market.

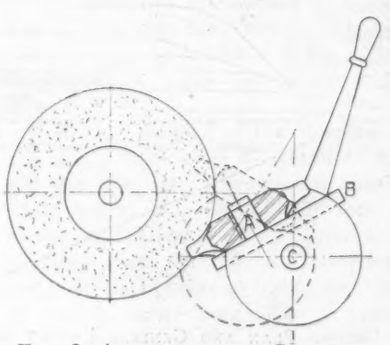


FIG. 2—ACTION OF THE GRINDER.

The column is of true box form and forms a cabinet for cutters, grinding wheels, etc. The regular equipment includes two grinding wheels, diamond truing device, bushes to take cutters with 1, 1 1/16, 1¼, 1½, 1¾ and 2-inch hole, and the overhead countershaft.

Germany's Machine Tool Trade.—The department of commerce and labor, department of manufactures, has issued a monograph of 246 pages on the machine tool trade in Germany, France, Switzerland, Italy and the United Kingdom. This is compiled by Capt. Godfrey L. Carden, of the United States revenue cutter service, special agent of the department of commerce and labor, and was originally published in the *Daily Consular and Trade Reports* during the first nine months of 1908. Capt. Carden was detached from the service in 1907 for this special work. The volume contains a vast amount of information on the machine tool situation in general in Europe and may be obtained by manufacturers and others interested by addressing the bureau of manufactures, department of commerce and labor, Washington, D. C. In this connection, the *Daily Consular and Trade Reports* of Saturday, April 10, includes a special report on American machine tools used in the works of H. Bollinckx, in Brussels, Belgium. The equipment of this plant, which is noted as one of the first in Europe in the production of high grade steam engines and for the high grade of its workmanship, is very largely American.

The report gives a list of the firms represented by their tools, together with the types of tools furnished.

Delegates from 21 local unions of machinists employed on the Illinois Central railroad from New Orleans to Chicago have begun the preparation of a grievance list to be presented to the superintendents of motive power. The minimum wage scale now received is 37 cents an hour. Some delegates are urging a demand for an increase to 42½ cents.

THE WORKS OF THE INDIANA STEEL CO.—IV[1]

The Auxiliary Shops at Gary.

The steel plant at Gary is intended to be self contained, as far as is practicable, in the making of its own repairs and filling its miscellaneous requirements. It is the expectation that as much care as any other department of the plant. This unusual outlay and attention expended upon a department which in many cases is a very minor detail of the steel mill was entered upon not so much with a view to the material made up for stock in the company shops, a large storehouse and storage yard is provided. Thus, it is hoped, the plant will be prepared in advance to the greatest possible extent for all emergencies which may arise.

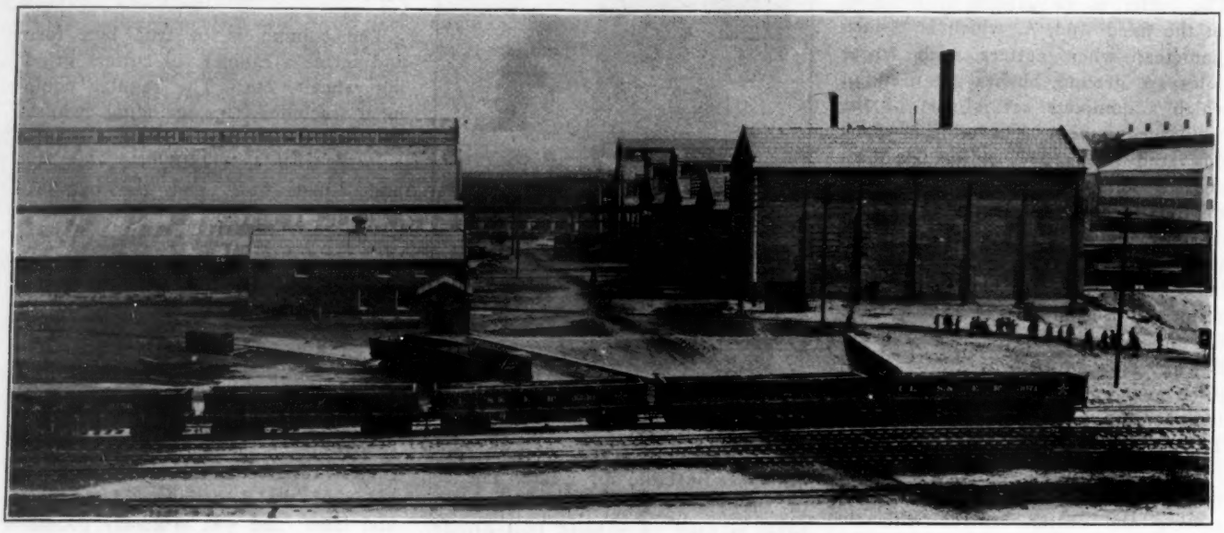


FIG. 1—VIEW OF AUXILIARY SHOP GROUP FROM MILL ENTRANCE.

all tools will be replaced or repaired within the plant, that tank work, castings and machining including the heaviest work will be turned out in the company shops. To this end large and completely equipped shops for all classes of work have been built with economical production, although the shops are well equipped to accomplish this, but to release the mills from dependence upon the outside shop whose unreliability in the matter of delivery and whose inaccessibility might frequently cause expensive delays in the operation of the furnaces or steel mills. For such material of staple or standard character as can be bought more advantageously, and for

The main entrance to the Gary plant is the extension of Broadway, the principal street of the town. Passing the general offices for the plant, the thoroughfare is depressed under the Chicago, Lake Shore & Eastern Ry. tracks and is continued within the plant limits to the finishing department of the rail mill, a distance of about 1,000 feet. In this length the roadway

[1]The preceding articles of this series were published in THE IRON TRADE REVIEW of Jan. 7, Feb. 4, and April 1, 1909.

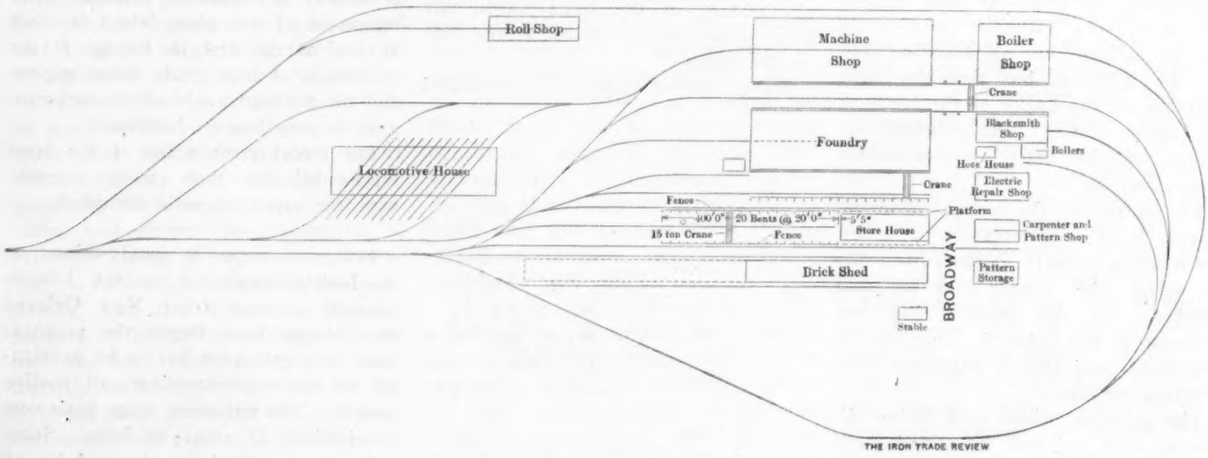


FIG. 2—GROUND PLAN AND GENERAL LAYOUT OF SHOPS.

which is about 100 feet wide, is flanked on both sides by the several shops. This group includes on the east side of the road the clock house, pattern storage, pattern shop, blacksmith shop, boiler shop and electrical repair shop. On the opposite side are the storehouse, foundry and machine shop. The group of buildings is laid out with freedom for expansion to the east and to the west by the lengthening of the buildings to twice their present size. Tracks enter each building connecting them with the main loop, and yard cranes parallel the several buildings for which material may be conveniently handled in this manner. All of the shops are enclosed in a uniform type of heavy steel and brick mill building of fireproof construction, with a central monitor roof and side bays. The walls are of red pressed brick and the roof of reinforced cement tile laid on the purlins.

that are ordered through the purchasing department. These are tagged with a blue card where the part is for the electrical department and with a red card when for the mechanical department. In the card record kept in the office corresponding cards of red and blue are used. For these special parts the superintendent of the department makes out a shop requisition which he gives to the storekeeper. Copy of this requisition is made in triplicate and a permanent record of it is made for the card record in the storehouse. The triplicate copies are sent to the purchasing department and executive offices. When the part arrives it is filed in the storehouse and by means of a regular notification system the department for which it was ordered is informed that it can be had.

The heavier materials, such as cable, metals, etc., are simply arranged about on the main floor at the rear. For

are located in a specially constructed chamber as a protection against fire and the gasoline tank is buried. Connections into the tanks are provided so that the oils may be run in direct from the cars. The office above is equipped with eight power and 21 hand pumps for drawing oil so that it is not necessary to go into the oil room. There are in addition to the above 12 additional tanks for various oils. Each of the eight large tanks has a capacity of 15,000 gallons and the smaller tanks 500 gallons. Altogether there is storage capacity for 127,000 gallons. Special oil-tank cars distribute oil to the different departments of the plant.

All of the lumber, heavy, light, flooring and pattern stock, although kept in a lumber yard near the pattern shop and in the pattern storage building, is distributed through the storehouse. Materials are brought from Chicago

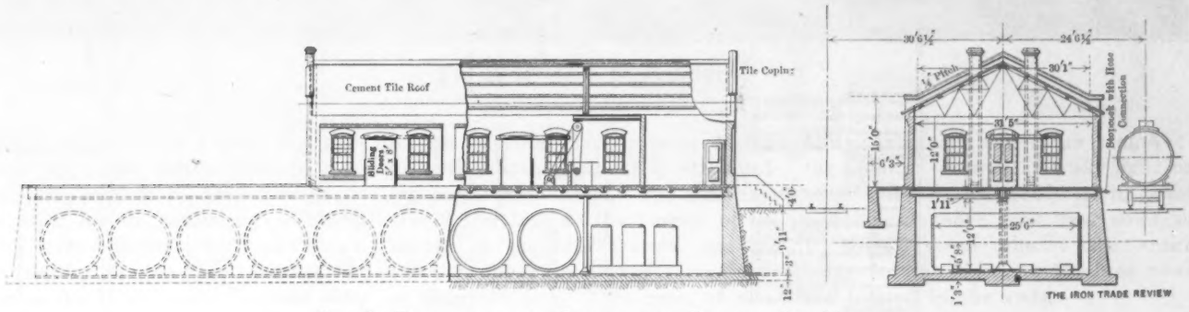


FIG. 3—ELEVATIONS AND SECTIONS OF CENTRAL OIL HOUSE.

The general storehouse is a two-story building 59 feet by 197 feet inside. Here is kept such material as bolts, nuts, washers, fittings, wire, cable, rope, waste, shovels, brooms, packing, asbestos and the various other miscellaneous articles required. On the second floor parts for electrical machinery are kept exclusively. The very small pieces such as washers, screws and similar parts are kept in drawers inside of the counter. For larger pieces bins are built in the front part of the main floor both along the wall and in rows at right angles to the walls. The bays of the building are numbered alphabetically along the building and in each bay the bins are numbered consecutively. All the material of a kind is grouped and by means of a card index system a record of its exact location and quantity is kept. The bays on the second floor are given a double letter to distinguish them from the first floor. A row of shelves is reserved for special parts handling cable a cable winding machine, measuring machine and portable cutting machine, together with reels, are installed. An electric elevator operates between the two floors. In the rear of the storehouse is a stock yard for iron and steel including shapes, plates, bars, tubing, piping and the various raw materials for the machine, blacksmith and boiler shops. For that material, such as sheets and piping, which requires protection from the weather, covered sheds are built. This stock yard is 400 feet long and 75 feet wide and is traversed by tracks which continue into the storehouse building and by a 15-ton crane. The height of the runway rail is about 20 feet.

Under the control of the storehouse are also a brick shed 50 feet wide by 400 feet long and a central oil house. This central oil house is 29 feet 9 inches by 118 feet 6 inches inside and contains eight horizontal cylindrical tanks 10 feet 3 inches diameter and 25 feet 6 inches long. These tanks

to the store house by special train which runs three days a week.

A steel works' foundry is essentially a jobbing shop which must be prepared and equipped to produce, on short notice, castings in iron, brass or steel varying in weight from a few pounds to many tons. The sections frequently made in a shop of this kind not only include repair parts for the rolling mills and blast furnaces, but ingot molds, iron and steel rolls, as well as repairs for practically the entire machinery equipment.

The foundry is unique in that it contains under one roof brass, iron and steel departments, and provisions were made when the layout was adopted for two 15-ton air furnaces, which will shortly be built. The shop is, therefore, in position to meet every requirement of the blast furnace, steel producing and rolling departments, and with the exception of a limited number of patterns, which have been permitted to remain with the makers of

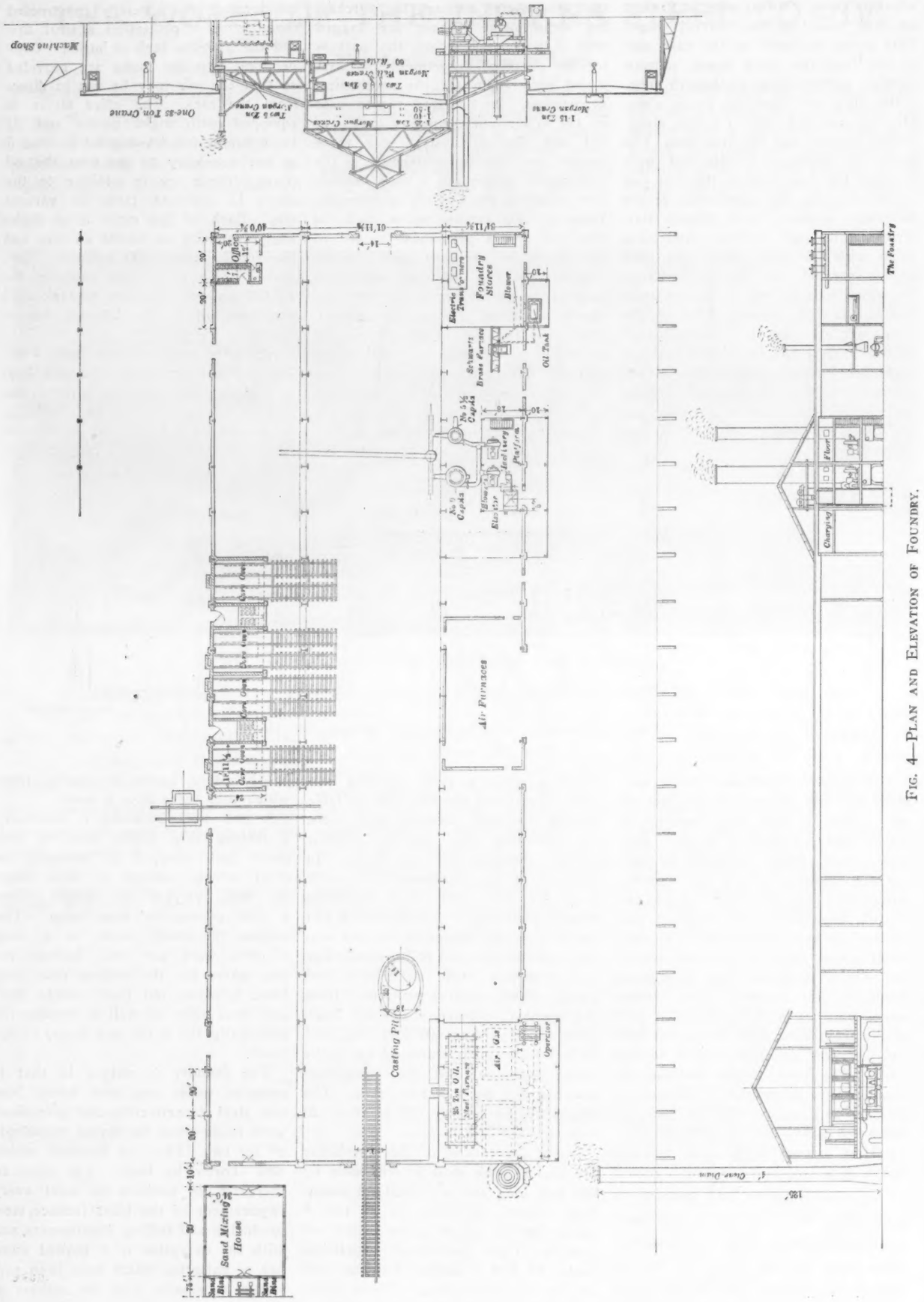


FIG. 4—PLAN AND ELEVATION OF FOUNDRY.

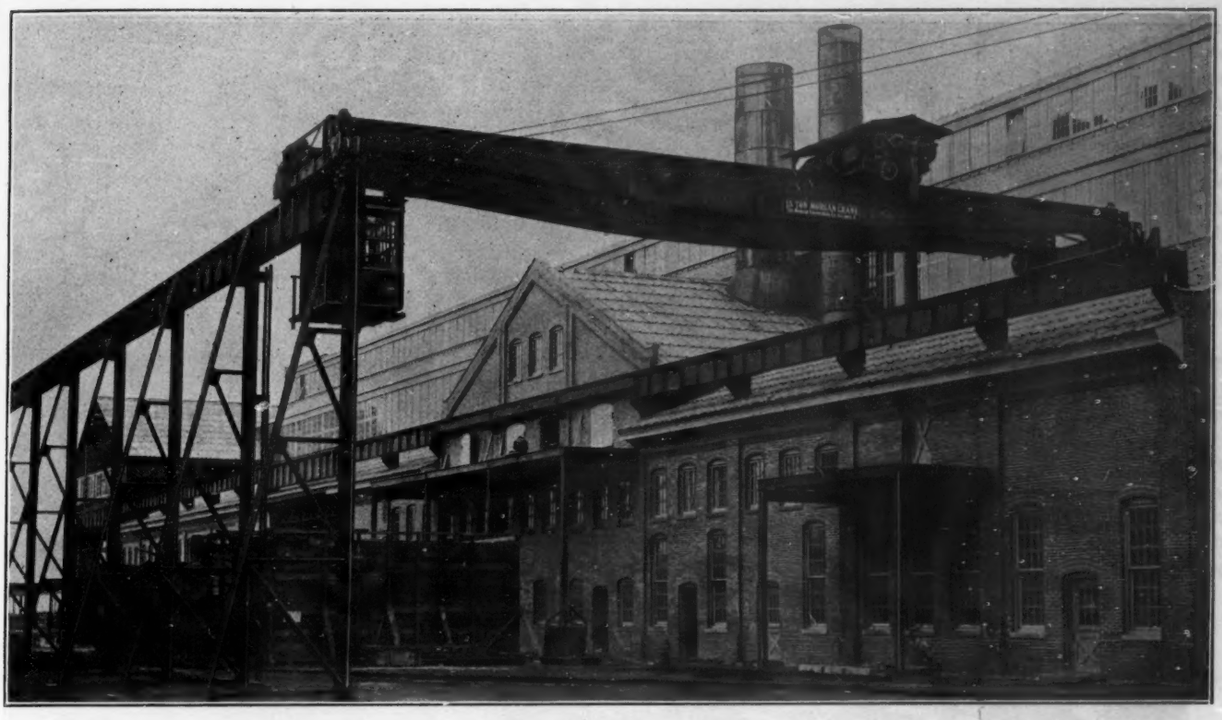


FIG. 5—EXTERIOR OF FOUNDRY.

equipment on which repairs are generally light, the pattern storage contains the models of the castings of the bulk of the machinery installed. With respect to the other repair shops, the foundry has been well located. It adjoins the machine shop on one side, a casting storage yard separating the two buildings, while the pattern and carpenter shop and the pattern storage are located on the opposite side of the main street, which extends practically through the entire plant.

General Arrangement of Foundry.

The general arrangement of the foundry is shown in Fig. 4. The building is of brick and steel construction 400 feet long, 137 feet wide, and is divided into three bays respectively, 35, 61 and 40 feet wide. In the side bay adjoining the raw material storage yard, the entire melting equipment is located including the brass melting furnace, cupolas, air and open-hearth furnaces. Heavy floor work is molded in the middle bay, while in the other side bay are located the core ovens, core making department and the light molding floor. A view of the center bay looking toward the core ovens is shown in Fig. 7. The building has a height of 74 feet to the peak, 48 feet 6 inches to the bottom chord of the roof trusses, and the base of the traveling crane rails is 33 feet 6 inches above the floor level, affording ample head room. The side bays are 22 feet high to the bottom of the chords of the roof trusses, and the traveling jib cranes have a clearance of about 15 feet. Two rows of windows, extending the entire length of the monitor, as well as a sky-light on both sides of the roof, afford good light from above, and two rows of windows extend almost the entire length of the sides, while three rows are located in the ends.

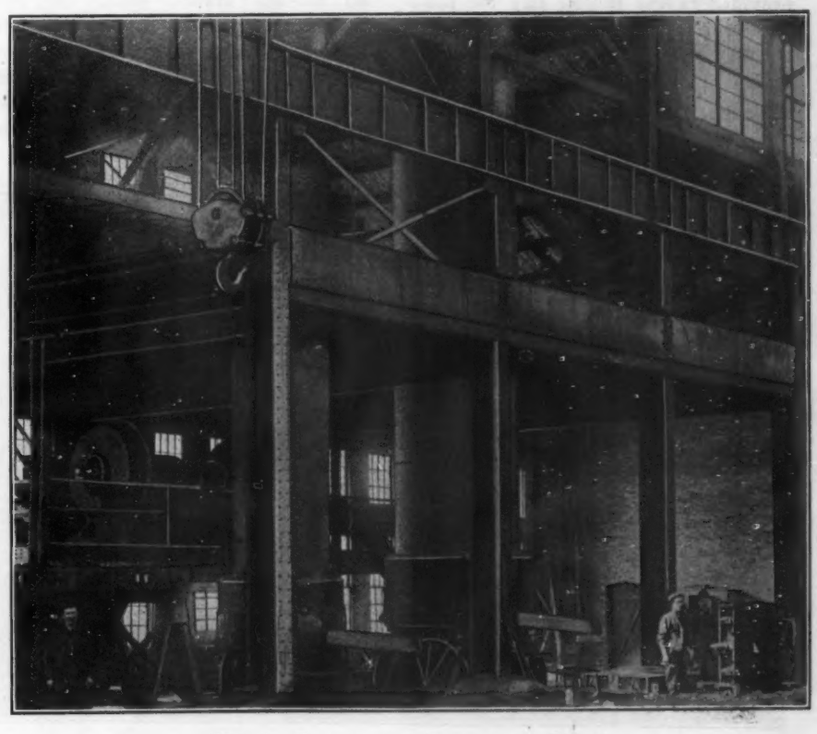


FIG. 6—CUPOLAS AND BLOWERS IN FOUNDRY.

FIG. 7—GENERAL VIEW IN FOUNDRY LOOKING TOWARD CORE OVENS.

Crane Equipment.

Sufficient crane capacity has been provided in the middle bay for handling castings up to 200,000 pounds in weight. It includes electric traveling cranes of 25 and 40 tons capacity each, and one of 50 tons capacity. In addition, two wall cranes are provided for handling flasks, rolling over molds, etc. The side bay in which the core ovens are located is commanded by two five-ton cranes, while the yard between the foundry and machine shop is provided with a 25-ton crane, and the storage yard on the opposite side has a 15-ton crane which is used for unloading cars and handling the raw material for the furnaces in the foundry. Railroad tracks extend through both yards for incoming and outgoing shipments, and a track is laid into the foundry at one end, while another extends through the side of the building into the machine shop for the shipment of castings to this department.

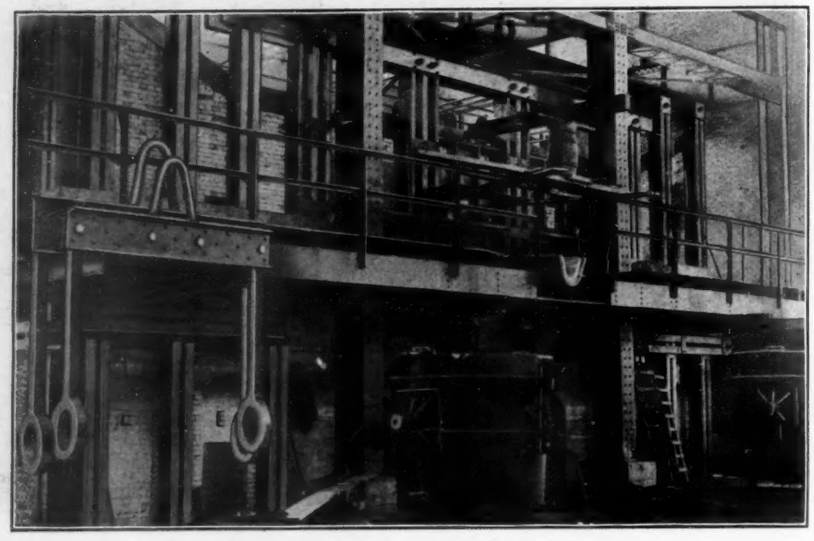


FIG. 8—THE 25-TON ACID OPEN-HEARTH FURNACE.

Casting Pit.

One of the features of the shop is the large casting pit located at one end of the middle bay near the open-hearth furnace which is used principally for casting rolls. The circular pit, 14 feet in diameter, has a depth of 27 feet, and the largest plate mill rolls now used can be molded and cast in the same. The oval pit which takes in the circular section referred to has a small diameter of 18 feet, a large diameter of 25 feet and is 14 feet deep. As the pit extends 7 feet below water level, it is enclosed by a steel tank protected on the outside with concrete, and is lined on the inside with brick. When not in use the pit is closed with a large cast iron cover to prevent accidents.

Cupolas.

Iron is melted in two Whiting cu-

polas lined up to 72 and 46 inches respectively. The motor driven blowers are located on a mezzanine floor, 18 x 40 feet, directly in back of floor 18 x 40 feet, directly in back of the cupolas, thereby reducing the length of the blast pipes to the minimum. The piping is so arranged that the blast from two blowers can be directed into either cupola as desired. The cupolas with the machinery platform are shown in Fig. 6. The cupola charging platform is 60 x 35 feet and the coke, pig iron, scrap, etc., are loaded into buckets and pans in the yard, and are elevated to an outside platform by the yard crane, as shown in Fig. 5, where the charges are placed on trucks on which they are conveyed to the cupolas. One corner of this bay is reserved for the production of brass castings, bearings, etc., and the metal is melted in an oil fired furnace.

Open-Hearth Furnace.

At the opposite end of this bay is located a 25-ton, producer gas, acid open-hearth furnace shown in Figs. 8 and 9. The hearth is 30 feet long, 9 feet 4½ inches wide and 24 inches deep. The spout is about 12 feet above the ground level, obviating the necessity of placing the ladles in a pit when tapping. A charging machine is used for charging the furnace and the gas is generated in two gas producers.

Core Ovens.

Plan and sectional views of one of the four core ovens are shown in Fig. 10. They are operated in pairs, firing pits being located between each pair to which access is had from the outside of the building, coke being used for fuel. Each oven is 20 feet wide, 24 feet long and 10 feet high, and is equipped with a Kinnear rolling door. Two tracks extending into the middle bay lead into each oven, in which four large core oven cars can be placed. The heat is distributed through large flues covered with perforated plates placed underneath the tracks on which the core buggies operate.

The sand mixing equipment is located in a building adjoining the foundry, this department being 39 x 34½ feet in size. The sand bins are in a covered structure, an extension to the sand mixing building, and have a capacity of 500 tons. The sand bins extend a length of 75 feet on either side of this structure, the re-

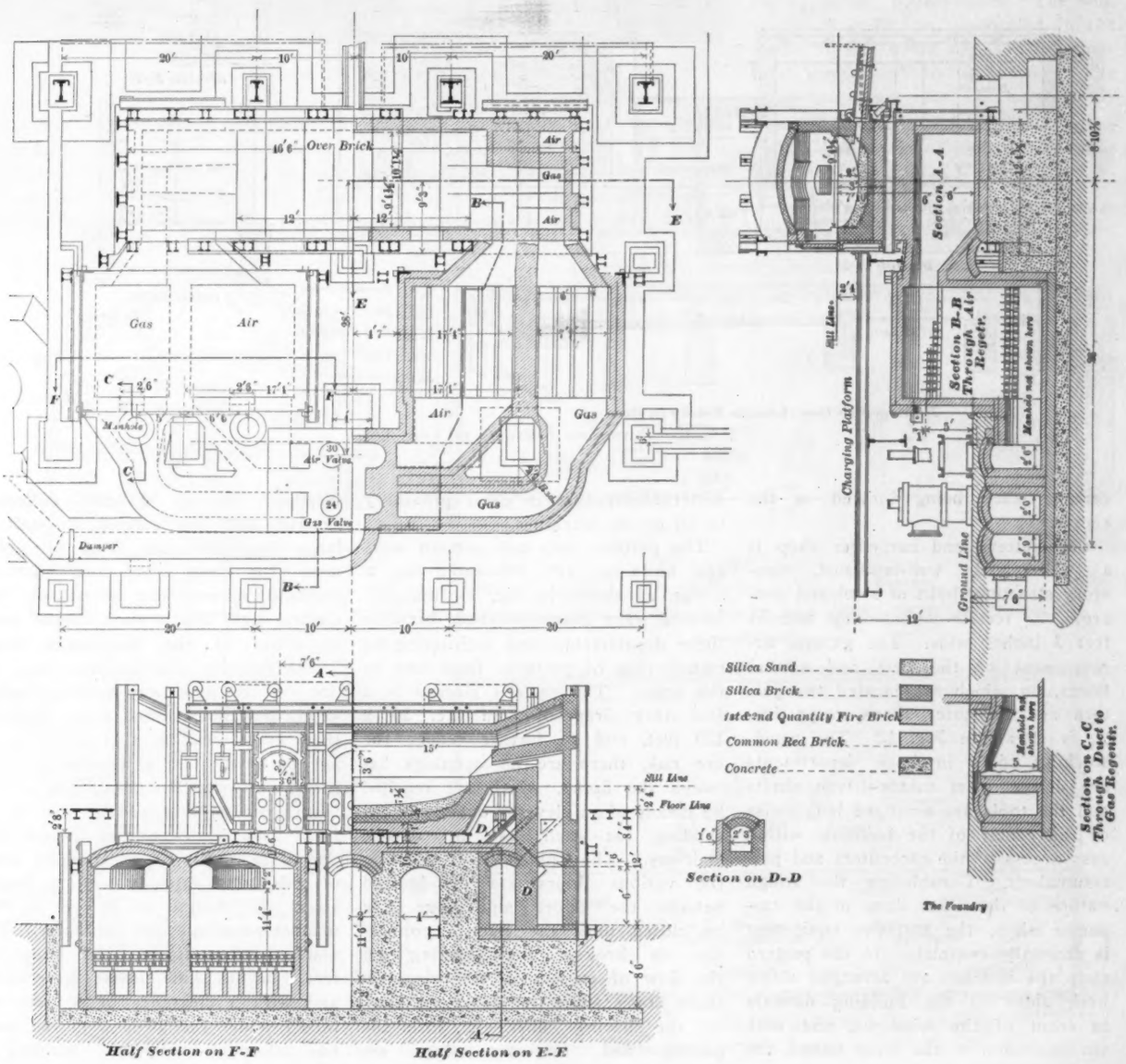


FIG. 9—PLAN AND SECTIONS OF OPEN-HEARTH FURNACE.

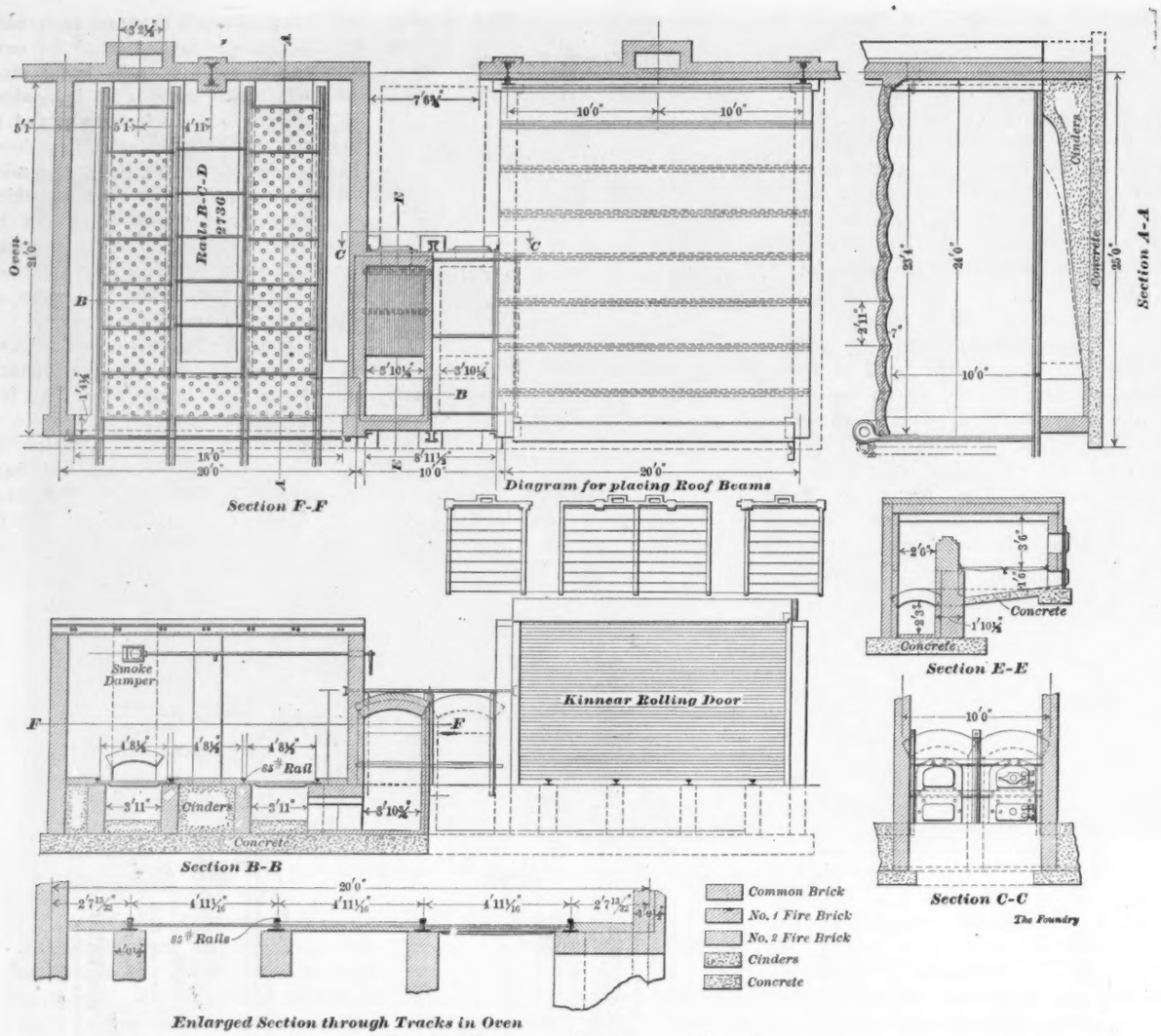


FIG. 10—PLAN AND SECTIONS OF CORE OVEN.

ceiving track being located in the center.

The pattern and carpenter shop is a well-lighted, well-ventilated, two-story structure, built of steel and concrete, 99 feet 3 inches long and 51 feet 3 inches wide. The general arrangement of the first and second floors, on which are located the pattern and carpenter shops, respectively, is shown in Fig. 12. The woodworking tools in both departments are driven from motor-driven shafts and the tools are arranged lengthwise of the center of the building, within easy access of the carpenters and patternmakers. Considering the rough nature of the work done in the carpenter shop, the machine equipment is unusually complete. In the pattern shop the benches are arranged along both sides of the building directly in front of the windows, and with the exception of the large lathes, the patternmakers are in close proximity to all of the machines.

The pattern shop and pattern storage buildings are connected by a bridge, as shown in Fig. 11, thus affording easy communication between these departments, and facilitating the transferring of patterns from one to the other. The pattern storage is a four-story fireproof structure, 50 x 120 feet, and to further reduce the fire risk, there are no openings between the floors, which are reached by means of an elevator outside of the building, as well as an outside stairway. The plugs for lighting the various floors are all located outside the doors and none can be closed until the electric connection is broken, thus cutting off the flow of current in the wires on these floors when the doors are shut. All the shavings, dust, etc., from the pattern and carpenter shop are disposed of by a dust collector system, and are carried through a large discharge pipe from a point near the rear of the pattern building across the front of the electric light repair shop to the boiler room of the blacksmith shop.

The foundry and machine shop on one side of Broadway and the boiler shop and blacksmith shop opposite them are aligned so that in the passage between them is erected a crane runway crossing Broadway with a total length of 664 feet and a span of 60 feet. Two cranes, one of 15 tons and one of 25 tons, with an auxiliary hoist of five tons capacity and a height above the ground of 28 feet in this manner serve all four buildings. The machine shop is 400 feet long, 146 feet 9 inches wide, inside dimensions, and with a clearance of 46 feet 4½ inches under the girders, in the main bay. Longitudinally, the building is

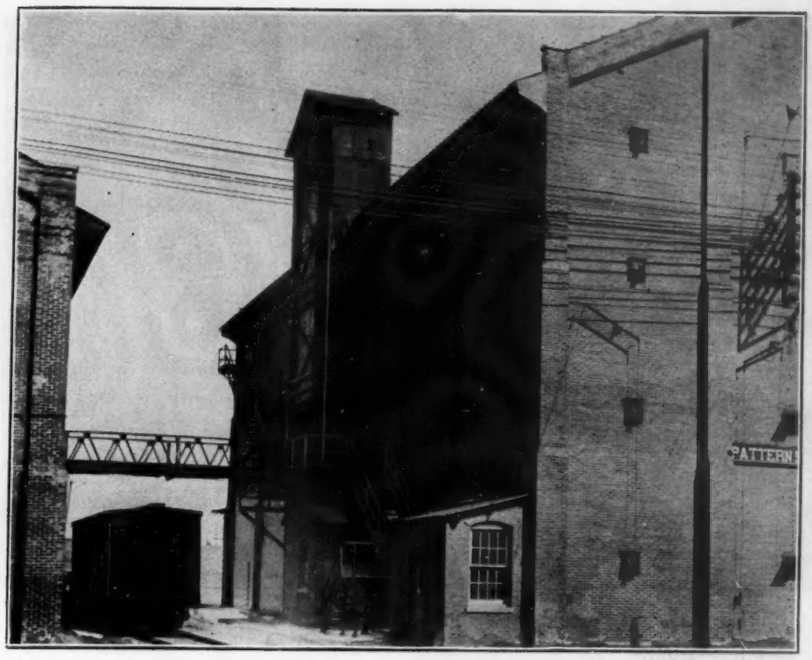


FIG. 11—EXTERIOR OF PATTERN STORAGE BUILDING.

arranged with a central bay about 75 feet wide and a 35-foot lean-to on each side. The lean-tos or side bays are not high enough for galleries. The general impression of the shop interior is one of unusually large floor space for the number of tools. Generally speaking, the tools, with the exception of some of the smaller ones and those in the tool room, are arranged along the two-column lines. This leaves the central bay with a clear floor for the handling of material. This floor is traversed by a track which runs entirely through the building and is served by two 25-ton cranes.

The south bay of the shop is fitted up for bench work, the benches being placed parallel to the wall. In addition there are on this side two small shapers, two upright drills, a small drill press and two pipe fitters' benches and four pipe threading machines. Along the columns on the south side of the central bay are placed the shapers, planers, drill presses, milling machines and special tools. On the opposite side of the central bay are located the lathes and boring mills. The lathes are arranged back to back. As indicated in the list of tools below there are included some very heavy tools as well as automatic machines for rapid and lighter work. The tool room, 28 x 40 feet, is located in the center of the north bay and is separated from the shop by netting. The shop foreman's office is immediately alongside in the center bay.

The equipment of the machine shop includes the following tools:

One—72 inches x 42 feet bed lathe, motor-driven.

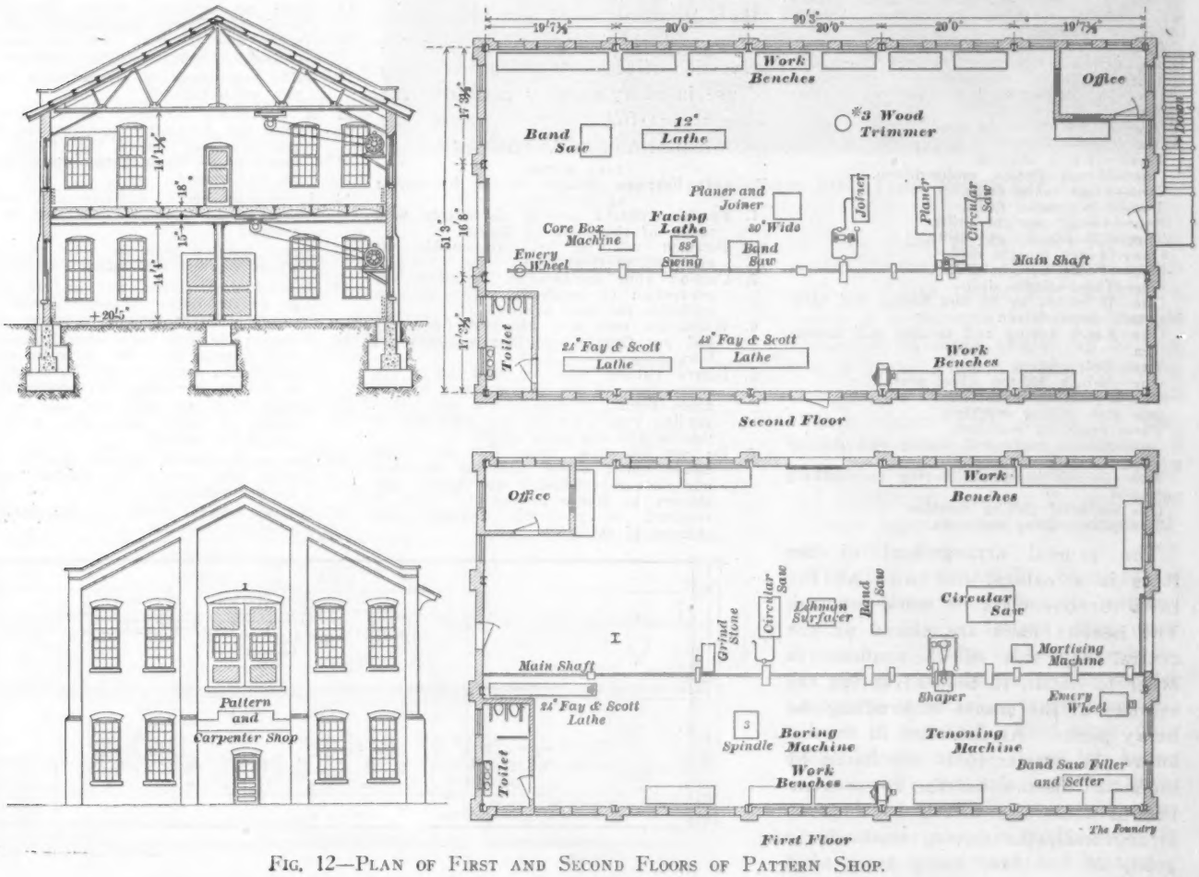


FIG. 12—PLAN OF FIRST AND SECOND FLOORS OF PATTERN SHOP.

FIG. 13—INTERIOR OF MACHINE SHOP.

Two—48 inches x 29 feet lathes, motor-driven.
Two—36 inches x 22 feet lathes.
Two—30 inches x 18 feet lathes.
Three—28 inches x 17 feet lathes.
One—28 inches x 26 feet lathe.
Two—24 inches x 16 feet lathes.
One—10 inches x 5 feet tool room lathe.
One—21-inch turret lathe.
One—69-inch driving wheel lathe with quartering attachments, motor-driven.
One—Heavy axle lathe motor-driven.
One—84 inches x 84 inches x 18 feet planer with four heads driven by motors, through pneumatic clutches.
Two—48 inches x 14 feet planers with four heads, driven by motors, through pneumatic clutches.
Two—36 inches x 36 inches x 10 feet planers.
One—26-inch traveling head shaper.
One—20-inch shaper.
Three—16-inch shapers.
One—24-inch slotter, motor-driven.
Two—6-foot radial drills.
Two—5-foot radial drills.
Four—44-inch upright drills.
Three—20-inch upright drills.
One—14-inch upright drill.
One—25-inch upright drill.
One—Three-spindle drill.
One—10 inches by 16 feet boring and turning mill motor-driven.
One—6-inch boring and turning mill motor-driven.
Two—Bolt cutters.
One—96-inch 300-ton wheel press.
One keyseating machine.
One slab milling machine.
Three centering machines.
One—80-inch horizontal boring and drilling machine.
Two—60-inch horizontal boring and drilling machines.
One universal milling machine.
Two plain milling machines.

The general arrangement of the tools is a natural one with all the tools for one class of work grouped. The heavier tools are placed on the central bay side of the column in order to obtain to best advantage the services of the cranes in handling the heavy pieces. As indicated in the list above the heavier tools are driven by individual motors, but the larger number of tools are driven in a group arrangement, the driving motor for a group of machines being hung on a platform over head at about the height of the shafting. There are four 75-horsepower induction motors for driving the line shafts, which extend the length of the building in each side bay.

The shop is interesting because of the provision for the safety and comfort of the employes. As in all of the other departments of the plant there are posted regulations relative to the prevention of accidents which are worthy of use in many another establishment. They are as follows:

INDIANA STEEL COMPANY.

GARY WORKS.

Rules to Foremen Relative to the Prevention of Accidents.

1. Foremen should provide themselves with copies of the Book of Rules.
2. Foremen will be held responsible for accidents to their men.
3. Caution your sub-foreman regarding the prevention of accidents. You are responsible for their actions.
4. Watch for men who are hurt frequently and put them where they will not get hurt.
5. Before putting men to work on a job warn them of the dangers and how to avoid them. If you find a man disregarding your warning, deal with him so that it will not occur again.
6. Do not put slow, heavy men on a job where quick, active men are required, nor place slow-thinking men around machinery or where presence of mind is required, or you will increase your chances of accidents.
7. Never work on a crane, table or other machinery before you have notified the operator, and attached a danger sign bearing your name at the point where the power is turned on.
8. If machinery, tools, or other appliances, with which you are working are dangerous, DO NOT CONTINUE TO USE THEM, but call your Superintendent.
9. When you finish a job leave the conditions safe; replace safeguards and do not leave loose material overhead.
10. When an accident occurs immediately notify the Safety Department, and preserve any material, tool or piece of machinery involved in the accident.
11. Drill your men to immediately notify you when injured.
12. A Foreman's Accident Report must be filled out for every accident, on forms provided, and mailed immediately; the names of all the witnesses should appear on this report.
13. Investigate every accident and try to prevent an accident occurring in like manner.
14. Never have a man in your employ to whom no one can talk.
15. Injured men should not be allowed to go to the doctor unassisted, where the injury is other than of a minor nature.
16. Foremen on one turn should report to and discuss with the foreman on the other turn accidents they have had, with a view to preventing like accidents.
17. When it is necessary for men to work above or below other men those men should be notified.
18. No runway should be less than 24 inches wide and should be cleated together on the under side.
19. All appliances should be frequently and carefully inspected.

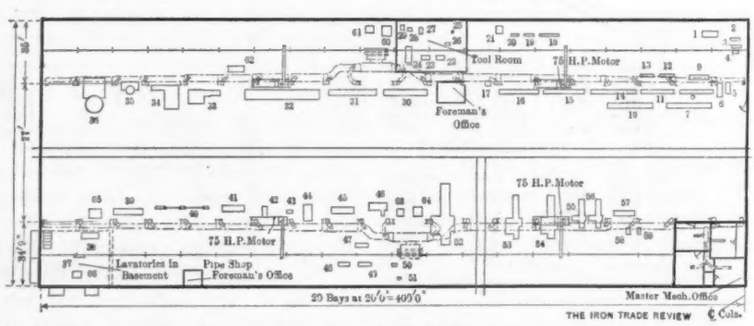


FIG. 14—GROUND PLAN OF MACHINE SHOP.

FIG. 15—INTERIOR OF BOILER SHOP FROM SOUTH BAY.

20. Before doing any work where there is danger of coming into contact with electric wires, notify the Chief Electrician, who will send an experienced man to advise concerning the work.
21. Care should be taken in loading material on cars, so that nothing will fall off in transit. See that weight of load is properly distributed on car and large pieces are braced.
22. In the process of new construction or repairs the surrounding premises must be kept as orderly as possible. Boards with nails sticking up must not be left lying around.
23. No person should be allowed to operate any crane or other machinery unless duly authorized by the proper authority.
24. Do not allow machinery to be started before the safe-guards have been replaced.
25. Make it your personal duty to see that the safe-guards and signs installed to promote safety are always in good condition.
26. REMEMBER:—THE PREVENTION OF ACCIDENTS IS ONE OF YOUR MOST IMPORTANT DUTIES.

W. P. GLEASON,
General Superintendent.

The machine shop is heated and ventilated by the hot blast system. The blowers and heating coils are hung above the bottom chord of the trusses in the side bays and the distributing pipes bring the hot air down on each side of each column. There is a blower on each side of the building with a capacity of 65,000 cubic feet of air per minute. The blowers are driven by 36-horsepower motors. This heating system is alike for all of the other shops as well.

The boiler shop is 160 feet long by 133 feet wide and its general arrangement is similar to the machine shop. The central bay is traversed by the railway track which is continuous from the machine shop and also by a 50-ton crane, with 60-foot span. Two-column jib cranes with a radius of 17 feet are also installed. The tools with which the shop is equipped are all driven by individual motors and they are arranged as in the machine shop, along the column lines. The equipment consists of one set of bending rolls, driven by a 23-horsepower motor with capacity for bending plates 10 feet wide and ⅞ inch thick; a set of bending rolls to handle plates 6 feet wide and

FIG. 16—INTERIOR OF BOILER SHOP FROM NORTH BAY.

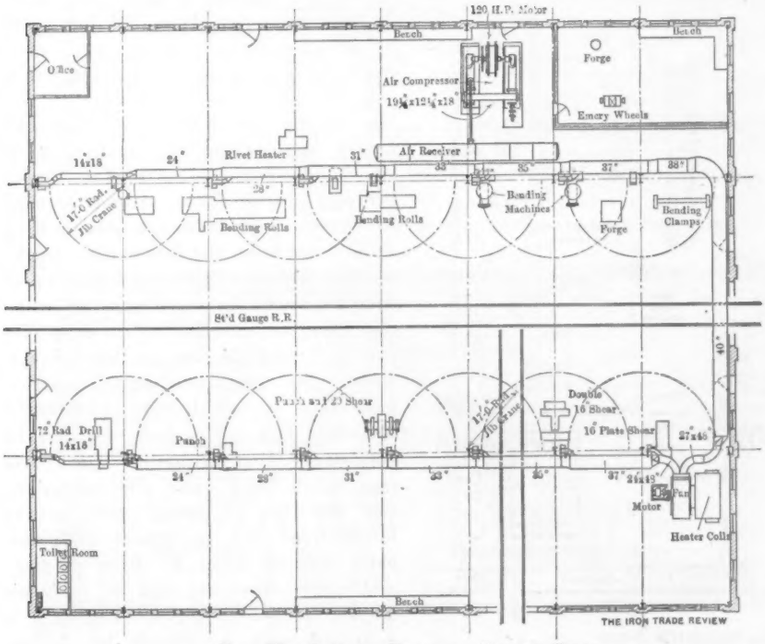


FIG. 17—GROUND PLAN OF BOILER SHOP.

⅝ inch thick driven by a 10-horsepower motor; one horizontal punch with an 8-inch throat for punching a 1-inch hole through 1 inch; an angle shear for handling angles up to 6 x 6 x 1 inch; a 12-foot plate flanging clamp; two double end punch and 16-inch shears each driven by 7½-horsepower motor; a large punch and 20-inch shear with a 30-inch throat and capable of punching 1½-inch holes through 1¼-inch plate and a large 72-inch drill press.

The shop is thoroughly equipped for pneumatic riveting. There is installed a 19¼ x 12¼ x 18-inch compressor driven by a 120-horsepower synchronous motor. In addition to the smaller pneumatic hammers, a large pneumatic riveter is installed. The large floor space affords ample room for laying out to which the side bays are more particularly devoted. The tool room of the boiler shop is equipped to do light sheet metal work and brazing.

The blacksmith shop is a building 62

FIG. 18—INTERIOR OF BLACKSMITH SHOP.

feet x 160 feet, with a wing for a boiler house 31 feet 6 inches x 60 feet. The shop is spanned by a 10-ton crane. The power tools are arranged in a row down through the center of the shop and the forges, 11 in number, are arranged along the side walls. The tools include a 2,000-pound steam hammer and a 6,000-pound double-frame hammer. The former has a 13-inch steam cylinder and the latter a 20-inch cylinder and a 54-inch stroke. In the center of the shop between the hammers is a large double end punch and shear. The tools are spaced sufficiently far apart so that all may be in operation simultaneously without interference as to workmen or material. The forges are 4-foot, down draft type. At one end of the shop near the heating furnaces are a 2-inch and a 1½-inch bolt heading machines. There are two double heating furnaces each 6 feet x 3 feet 8 inches. The rear of the heating furnaces extends through the partition into the boiler room from which room they are fired. The anvils are mounted on heavy timber blocks. In the boiler house adjoining are installed two Stirling boilers, each of 310 horsepower; these supply steam for heating as well as for the steam hammers.

The extent of the electrical installation at the Gary plant demands unusual facilities for repair and the electrical repair shop is of more than ordinary proportions as to size and equipment. It is 62 by 120 feet and on one side has a 14-foot gallery where armature windings and similar work may be repaired and conveniently handled. The offices of the chief electrician are located in this building as are the offices of the master mechanic in the machine shop. The main floor of the shop is spanned by a 10-ton crane. On the side of the main floor under the gallery a row of benches arranged at right angles to the wall are placed, and adjacent to them a small wood working lathe. On the opposite side of the room the tools include a power press and forge, a shaper, milling machine, two upright drills, a gang drill and two lathes. The central portion of the floor is largely given to floor work of various kinds.

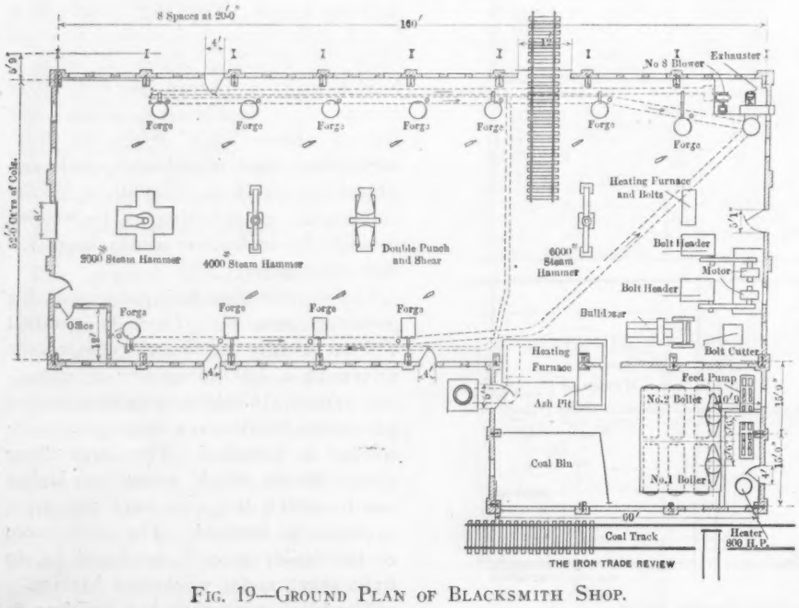


FIG. 19—GROUND PLAN OF BLACKSMITH SHOP.

Although removed some distance to the west of the shops already mentioned the roll shop and the locomotive repair shop are properly a part of this group. The roll shop is a building 56 feet 3 inches wide by 200 feet long. It is reached with ample trackage facilities from all of the mills with relation to which it will be centrally located. The floor of the building is spanned by a 15-ton crane. The roll turning lathes are placed in the east half of the building and arranged parallel to each other and at right angles to the north wall. The lathes are all motor-driven, the motors being placed along the wall and each amply protected by a heavy enclosing shield. There are nine lathes in all; one 60-inch with a 36-foot bed, one 60-inch with a 30-foot bed, four 44-inch and three 34-inch. The west end of the building is filled with roll stands.

The locomotive repair shop is intended for the repairing of the plant locomotives only. It is 104 feet wide by 259 feet long. A group of nine tracks pass through the building from side to side at such an angle to the line of the building as to make the curves approaching the building very easy and short. The engines enter through 18-foot doors. Hoods leading to vents in the roof are arranged to drop down over the locomotive stacks so that a live engine may be run in and the smoke be taken care of without filling the interior. Two drop pits run at right angles to the tracks. These pits are traversed by narrow gage rails on which runs a mounted hydraulic jack. This jack can thus be run under the locomotive and parts may be dropped down and carried to one side, the pit being open, or the locomotive may be raised and new parts replaced under it. Blow-off pipes and water lines are run to each pit as well as hot air pipes. The shop is equipped with a 30-inch by 12-foot

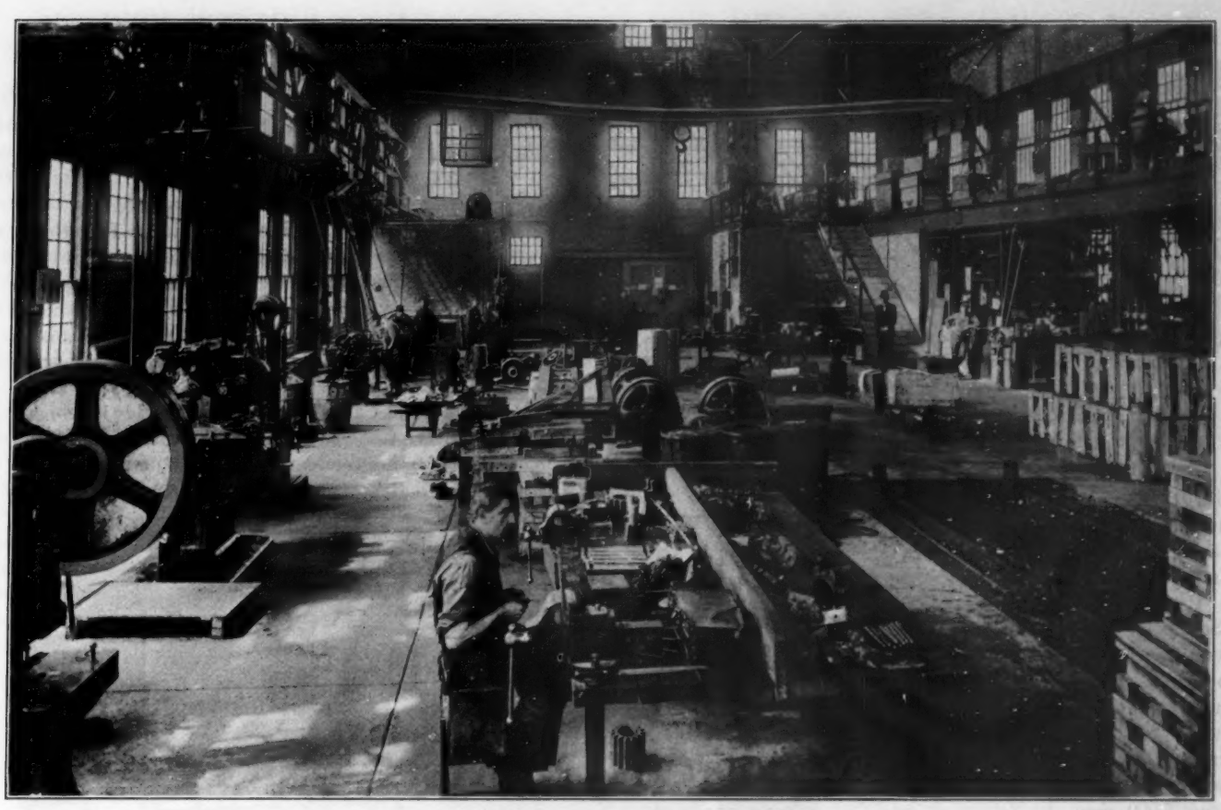


FIG. 20—INTERIOR OF ELECTRICAL REPAIR SHOP.

lathe and a heavy wheel lathe. There is also a small tool room.

At the entrance to the shop group is the time clock house for the plant. There is but the one entrance to the mill grounds and all the workmen pass in and out through the main entrance. This permits of centralizing the work of checking the men in and out. The building has doors at each end through which the men pass into parallel lanes and pass by the clock which registers the time for their department. Going in in the morning the workman takes his card out of the racks, passes along, drops it into the "in going" receiver of the clock, has it stamped

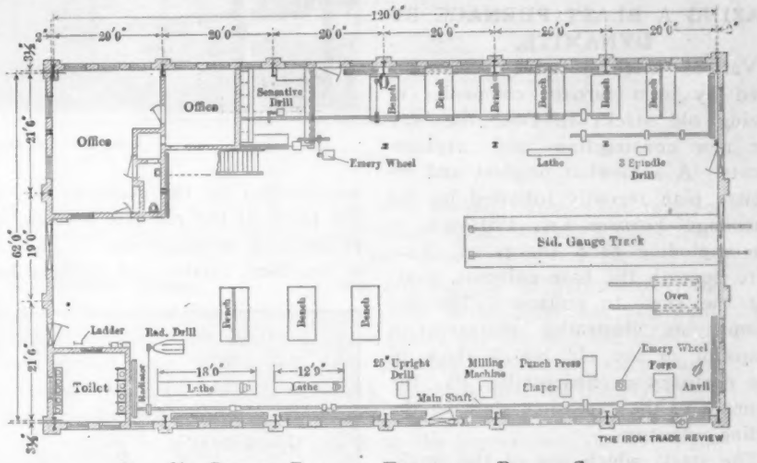


FIG. 21—GROUND PLAN OF ELECTRICAL REPAIR SHOP.

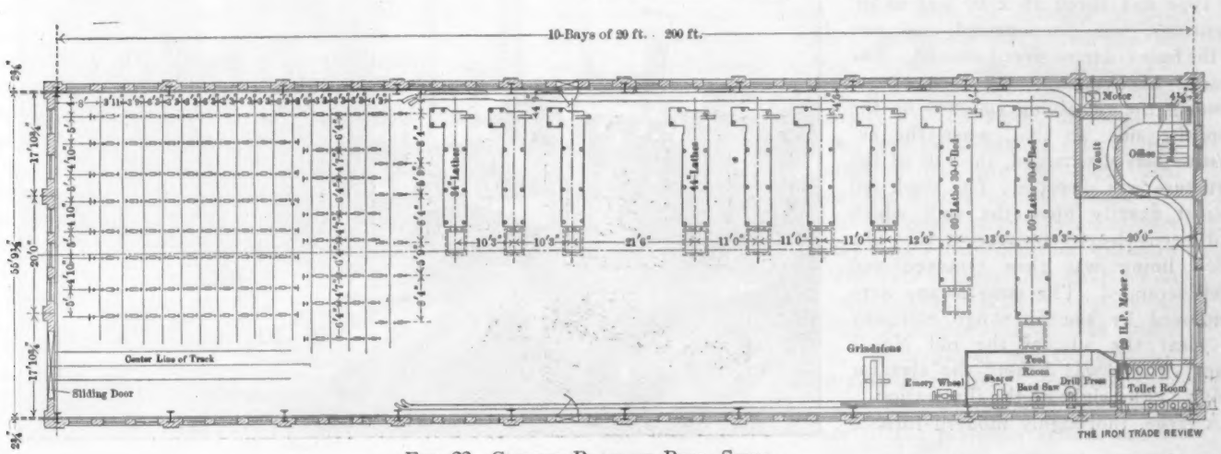


FIG. 22—GROUND PLAN OF ROLL SHOP.

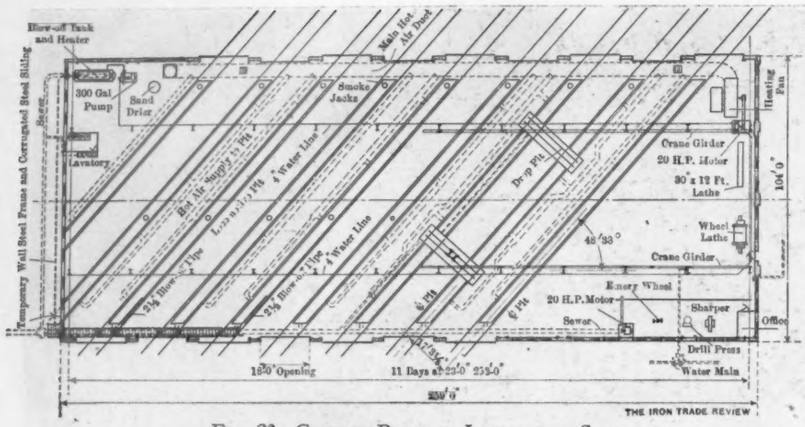


FIG. 23—GROUND PLAN OF LOCOMOTIVE SHOP.

with the time and takes it into the shop to be checked up by the foreman. Coming out at noon he takes his card from the shop rack, drops it in the "out going" receiver of the clock as he passes and leaves it in the clock house rack. The same routine applies in returning at noon and going out at night. Proper place is provided on the card for overtime. With this system this comparatively small house can be made to record the time of about 5,000 men.

RAZING A BLAST FURNACE BY DYNAMITE.

Various methods have been pursued by blast furnace companies in razing old stacks to clear the way for new construction and replacements. A somewhat original and effective plan recently followed by the Shenango Furnace Co., Pittsburg, is the exploding of a charge of dynamite beneath the base columns, causing the shell to collapse. The accompanying illustration represents a snapshot of the old No. 1 stack of the company at Sharpsville, Pa., the moment of the explosion, showing the falling structure.

The stack, which was of the smaller type and about 16 x 60 feet in dimensions, was disconnected, and two of the base columns were removed. The charge of dynamite was then placed beneath the remaining columns on the opposite side, so that, when the explosive was discharged, the fall of the structure was directed. The stack fell almost exactly upon the spot which had been cleared to receive it. The brick lining was then removed and shell scrapped. The same means were employed by the Shenango company to clear the site of the old No. 2 stack, which was behind the elevator hoists at the right of the illustration.

A large, thoroughly modern furnace was erected by the company to take the place of the old No. 1 stack, and preliminary arrangements in the way of ore bins, larries and trolleys have been made toward constructing a similarly up-to-date No. 2 furnace. The company has also just completed the rebuilding of its No. 3 furnace to which a height of 6 feet was added and equipment installed to make it a mechanically filled stack.

Step in Reorganization.—The Georgia Steel Co., a subsidiary of the former Southern Steel Co., organized recently at Atlanta by the election of the following officers and directors: President, D. G. Boissevain; vice president, D. Little, New York; Joel Hurt, J. Carroll Payne, Wingfield Jones, all of Atlanta, and Alexander Chambliss, Chattanooga. The announcement was made that improvements estimated to cost $250,000 will be made on the company's property in Georgia, which includes 40,000 acres of iron ore land.

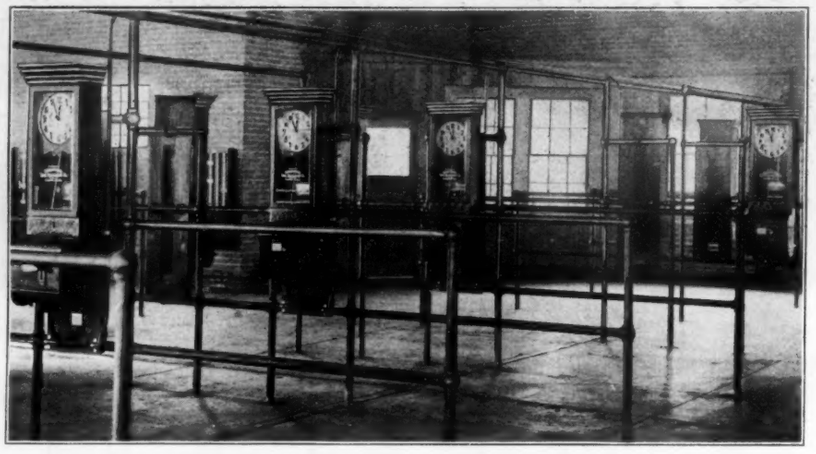
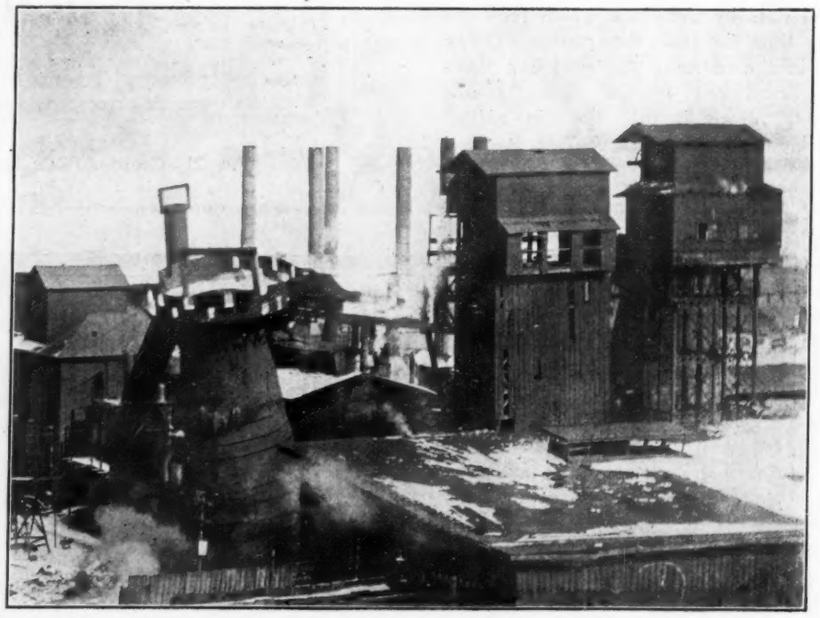


FIG. 24—INTERIOR OF TIME CLOCK HOUSE.



PREMIUM SYSTEM.[1]

By F. C. Blanchard.[2]

This is a large subject and has already been well covered along certain lines. This system was undoubtedly first developed and applied to comparatively heavy work where each job or operation required a considerable time to complete, and where each operator or mechanic could be handled independently. Much less has been published in regard to the application of the Premium System principle to the more rapid operations of lighter work of a manufacturing nature. Here are found both independent operators and those working together in teams, gangs or jobs. It is the object of this paper to describe premium system methods which have been used in connection with this lighter work in the case of both individual and gang operations.

First taking up work where independent operators run screw machines, turret lathes or drill presses on repetition work and disregarding matters of a general nature which should be carefully considered before attempting to change work from a straight day-time basis to a premium basis or any other system of payment, which matters will be discussed later in this paper, the first and most important requirement is to set a fair price on each operation. Before a price is determined, it should be known that the method, the machine, the tools and the material are all suitable and in good working order. The operator should be timed on at least three repetitions of the operation by a man who knows that the operator is moving along with reasonable skill and diligence. The timing should be done preferably by a stop watch and without the knowledge of the operator. The man doing this may be located some distance away from the operator, may keep the stop watch in his pocket and does not need to keep his eye on the operator every second. It is not good policy to stand right over the man doing the work and flash the watch in his face, for the following reasons: The operator may become nervous and lose time. He may be inclined to slow down when he divines the purpose of the timing. He may try to create an impression on the observer and speed up abnormally. None of these conditions forms a good basis for price setting as the calm, steady swing of regular operation without interference or pressure. The timings being made, we have the basis for setting the price. A form something like Fig. 1 is used where operation numbers are assigned, the operations are defined and described and the observed times entered. The average of these times is calculated and from this the theoretical pieces per day. It cannot be expected that a man will produce the theoretical pieces per day in a day's time. His tools must be ground and reset. His machine must be oiled and cleaned.

THE BLANK MFG. NAME OF PIECE 3/4" Siphon Bulb. DRAWING NO. X-1323 PREMIUM OPERATION DATA SHEET

OPERATION NO.	OPERATION DESCRIPTION	TIME (IN SECONDS) OBSERVED			AVGE.	PIECES PER DAY THEOR.	DISC.	ACT'L	DAY RATE	MINIMUM PCES.	MINIMUM RATE	EXCS. PER 100	OCSV. BY	FIG'D BY	O.K. BY	DATE
81	Threading Top End	32	30	28	30	1200	25	900	1.75	500	1.25	.125	C&S	WRJ	FCB	3/27/9
82	Threading Bott. & Forming	85	84	87	85	424	15	360	2.00	200	1.43	.36	"	"	FCB	4/6/9

Fig. 1.

Legitimate Delays.

A belt will break occasionally and other legitimate delays must be recognized and provided for by the person determining the proper discount to apply to theoretical pieces per day in order to settle on a reasonable number of pieces to constitute a day's work. In the writer's experience on light work, the theoretical pieces per day must be discounted, generally speaking, from 10 to 30 per cent. This should be done with good judgment, and the experience gained at first in doing work of this character will soon train the right man so that he can get good results and arrive at the number of pieces per day to constitute a reasonable day's work. The next item is the rate per day. This represents what each job is considered to be worth on a day work basis, and should be considered entirely independent from the day rate of any operator that may happen to have done such work before the premium rates are established. In other words, the writer believes that certain operations should be rated as worth so much per day on a day work basis, and it then generally becomes known that a certain job has a certain rate, and any operator capable of performing certain operations should be designated for such work independently of the day work basis that may be placed on each operation. This is a decidedly impersonal basis and encourages operators on lower grades of work to so perfect themselves that they may have opportunity to undertake work which is rated on a higher day work basis. Conversely it provides an argument to meet any complaint that may arise from an operator with a higher day rate when placed on a job that is rated at less per day. He can be told that his day rate is higher, and that presumably he is a more competent man and can undoubtedly perform enough more of the work to bring his earnings into line with his day rating. The rate per day being established on a basis fixed by the nature of the work, and the skill required for its performance, the next step is to determine the minimum pieces per day and the minimum rate per day. These are rather arbitrary elements and are simply established to enable us to place such a rate on the excess over the minimum, that the employer will share to a certain extent with the operator in production exceeding the production required to equal the day rate. The writer has arbitrarily set the minimum pieces at five-ninths of the pieces per day and the minimum rate at five-sevenths of the rate per day. This leaves four-ninths of the pieces per day to be done at two-sevenths rate per day, and a little figuring will show that the excess pieces are paid for at just one-half the price per piece as for the minimum pieces. In other words, the employer and the operator share alike in the fruits of excess production. This is the well recognized feature of the premium system and it is well known that different concep-

[1]Paper read at the annual convention of the National Metal Trades Association, New York, April 15, 1909.

[2]Works manager and treasurer, the Ashcroft Mfg. Co., Bridgeport, Conn.

tions of the system and different conditions tend to greatly vary the division of the excess between employer and employe. This phase of the subject has been thoroughly discussed in the past and the writer will not enter into it further here. It cannot be claimed that there is any particular science in the method of figuring the rates after the pieces per day and the rate per day have been established, but the method is simple and has worked out satisfactorily.

Team Work.

The second case, where operators are working together in a team, gang or job, requires different treatment, for the reason that any particular effort on the part of an individual will not result in greater production, as the nature of the work is such that a piece passes from hand to hand, and the total production is almost wholly governed by the speed of the slowest men on the job. It has generally been the custom to constitute one man the head or leader in a gang of this nature and prices have been arranged with him for producing work. This leader has thereby pocketed all the profits or stood all the losses according to his ability to drive his team. This arrangement is the common form of contract system which has been considerably used in the past, but which has fallen into bad odor amongst most modern manufacturers for a number of well recognized reasons. This leader is vitally interested in the day rates of his operators and is liable to dictate in these matters where it is much better that rates of labor should be set by the management of the factory and not by a large number of contractors. Further than this the leader must be continually driving and pushing the men under him, taking much away from his own ability to perform work, and creating friction and bad feeling in a great many ways. The writer has used for the last four or five years a system whereby every member of a gang is allowed to share in the profits obtained from excess production. Considerable opposition was raised to the introduction of this system at first by the leaders, they very naturally figuring that the premium paid to the operators in their teams would come out of their own pockets, and their profits thereby reduced. Experience has shown, however, that this is not the case, for the reason that any system which obtains and holds the interest and co-operation of everyone involved in the work, will so greatly increase the production that extra profits are made to such an extent that every member of the team will have extra money coming to him on each pay day, and the leader will draw as much money as he formerly drew under the old system. It is not difficult to see why this is the case. It is "team work." We see it illustrated continually in athletic contests. Who would expect a crew with a star stroke oar and seven indifferent men to stand any show against a crew of eight reasonably good men pulling together and every man to get a share of the prize-money if his crew wins? The leader sets the pace and his operators follow. He does not need to get behind and prod, nor does the management need to point out any laggards. The majority of a gang will want to do the right thing and will hope to make some extra money, and if one or two of their mates should hold back, they will be so treated by the other members of the team that they will either speed up to the pace set by the team or will be crowded out and replaced by more willing workers. The writer has found this condition of things to obtain automatically within the team itself and not require much supervision by the general management of the factory. This system can hardly be called a "premium system" in the strictest sense of the term. Fig. 2 shows a form which may be used in figuring work on this basis. Generally speaking, a straight piece work price is set for each job and the value of the work produced by the team is thus figured. Taking the case shown on Fig. 2, we find that work to the total value of $47.50 was produced during the week ending March 27. Each of the four operators has his own day rate, depending upon his ability and the nature of the work which he performs. This multiplied by the number of hours that he has worked during the week gives the amount which would be due him on a straight day work basis. Summing these up for each operator gives the total labor cost of the work produced, as shown on the left side of the form. The difference is the excess earnings, or premium, which is divided among the members of the gang in the ratio that each man's earnings on a day rate basis bears to the total day work cost of the work produced. In actual operation, the management may set each operator's day rate according to its best judgment, and will naturally place the leader's rate higher than the rate of any other operator, and may increase or decrease the rate of any operator in the gang as his worth may increase or decrease. It will readily be seen that the premium is divided according to the skill, ability and application of each man in the gang, and while a competent and hustling man as leader gets a much larger portion of the premium than an unskilled boy who may be assisting, the writer believes that this forms an equitable method of distributing the premium, and at the same time gives everyone an incentive to do the best team work possible, and further to so increase his individual skill and ability that he may merit an increase in his day rate and thereby receive a larger share of the premium.

In a general way, the writer feels

THE BLANK MFG. CO. — PREMIUM JOB SHEET

JOB Yago Spring LEADER J. Brown WEEK ENDING 3/27 1909

WORK DONE		PRICE	AMOUNT		NAMES OF OPERATIVES	DAY RATE EARNINGS				PREMIUM EARNED		TOTAL EARNED	
QUANTITY	DESCRIPTION					HRS.	RATE	AMOUNT					
253	#7 Common	.030	7	59	J. Brown	55	30	16	50	3	96	20	46
340	#2 Heavy	.025	8	50	P. Smith	55	25	13	75	3	30	17	05
698	#3 Special	.045	31	41	E. Rose	11	25	2	75	0	67	3	42
			47	50	R. Small	53	10	5	30	1	27	6	57
								38	30	9	20	47	50

FIG. 2.

that it would be a mistake for any one to attempt to change the method of payment throughout a shop or factory instantaneously, and, recognizing that all such changes are viewed with more or less suspicion, believes that it is best to start in a small way with those jobs which will make the best showing, and with those jobs handled by men most favorable to the introduction of a system that will enable them to earn more money by increased effort. One job started right is the best possible advertising throughout a shop, and soon paves the way for starting a second job, and so on, by slow, persistent and careful work, a very large percentage of operators in almost any shop or factory can be gradually changed over to better systems of payment, resulting in reduced costs to the employer and increased earnings to the operator. The writer has seen costs reduced in this manner from 30 to 60 per cent, and in places where it was supposed that the work was going along fairly well on a day-work basis.

It hardly needs to be stated that one of the most important considerations is to correctly set the prices. If set too low, no premium will be made, and the employes will become discouraged and dissatisfied with the system. If set too high, the operators are liable to have a quiet laugh on the management, and to take things pretty easy at the expense of high factory costs. A price once set should not be changed unless it is considerably in error, and it is of course easier to raise a price than it is to lower it after the same has once been established, whereby it is better to err on the low side than on the high side in setting the price. If it is found after some experience that certain prices are too high, the matter of reducing same should be handled with gloves. The practice in some shops of making a horizontal reduction in all prices at yearly intervals or at any one time is a bad one and should be avoided. With nearly every man in the shop disgruntled and dissatisfied at the same time, the chances for organized opposition are much greater than if, occasionally, only a very small percentage of the help are given cause for injured feelings. It is well to investigate any prices that seem to develop as being too high and by making some little change in tool or method effect a reduction of time, and use this as a reason for reduction of price. A little tact and ingenuity can be used to good advantage along these lines.

The writer believes that it is best to arrange the administration of any premium system to effect settlements with the help every regular pay day. As a rule the employes need the money and feel that the excess earnings belong to them rightfully and are not in the nature of a gift to be bestowed by the management of the factory at its convenience.

The question of allowing department foremen to share in the premiums earned in their departments is sometimes raised. While many managers would like to reward their foremen for efficiency under their jurisdiction, it must be carefully noted that many foremen thus sharing in premiums would likely be somewhat biased when questions of prices came up for discussion and treatment.

EXPERIMENTS UPON THE FORCES ACTING ON TWIST-DRILLS WHEN OPERATING ON CAST IRON AND STEEL[1]

By Dempster Smith[2] and R. Poliakoff.[3]

It will be generally admitted that more experimental data and practical information concerning the durability and forces exerted on cutting tools have been published within the past few years than in all their previous history. This has been commonly attributed to the new conditions arising from the general adoption of high heat steel in modern machine-shop practice. Up to the present the single-edged or lathe tool has received most attention—being the form of tool in most frequent use in the machine shop. The experiments recorded below were made with a double-edged cutting tool in the form of an ordinary twist-drill. It is hoped that they may prove of service to the machine designer and user alike. They represent part of the work done during the last three years by the mechanical engineering students in the Machine Testing Laboratory of the Manchester Municipal School of Technology.

Previous Experiments.

Before discussing the experiments, it may not be out of place to give a brief resume of the most important work done in this field of research.

Amongst the first experiments of any note with twist-drills are those recorded by Prof. L. P. Breckenridge in the *Journal* of the Lehigh University Engineering Society for October, 1898. Prof. Breckenridge asked himself, "What pressure comes on a drill press when drilling cast iron with a 1-inch twist-drill?" The results obtained in his experiments are given in Table I:

TABLE I.—Prof. Breckenridge's Experiments.

Diameter of Morse taper-shank twist-drills, inches.	Maximum pressure on drill while drilling at start, pounds.	Maximum pressure on drill while drilling with full diameter of drill, pounds.
¼	400	350 to 400
½	900	800 to 900
¾	1,100	800 to 900
1	1,450	1,000 to 1,150
1¼	1,800	1,000 to 1,150

Medium cast iron was used in these experiments, but in the abstracts at hand no mention is made as to whether the skin was removed or not, neither is the nature or rate of feed given. No attempt was made to measure the twisting moment. The results are given here simply to show the extent of the published information at that time. Previous to this several writers affirmed that 1,500 pounds per inch diameter had to be applied to the end of a drill to make it take its proper cut. The cut and material, however, were not specified.

In 1902, Mr. Norris, of the Bickford Drill & Tool Co., Cincinnati, instituted a series of experiments with ordinary commercial twist-drills (carbon steel) to determine the most economical feed and speed, and also to get an estimate of the power absorbed when drilling cast iron. In the first set of experiments, he found that a ¾-inch drill would withstand a feed of 1/16 of an inch per revolution when drilling ordinary cast iron at a speed of 267 revolutions per minute, this being

[1]Abstract of a paper read before the Institution of Mechanical Engineers (Great Britain), March 18, 1909.
[2]Associate member of the Municipal School of Technology, Manchester.
[3]Imperial Technical Institute, Moscow.

the coarsest feed provided on the machine. It was also found impossible to break drills larger than the above when operating at the same feed and on the same material. These experiments resulted in the adoption of feeds in the Bickford shops which were about four times greater than those recommended by the Morse Twist-Drill Co. at speeds not less than that given by that company. The conclusions from these trials were: The net horsepower per cubic inch of metal removed slightly decreases with the increase of feed for a given diameter of drill and speed. The net horsepower per cubic inch of metal removed also decreases with the increase in diameter of drill. The cutting speed for each drill varied, however, decreasing with the increase in diameter. While these power tests afforded considerable information which had hitherto not been available, they were not so regular or consistent as those obtained by Mr. Norris in his second set of experiments.

From a second set of power trials carried out on a specially rigid machine designed for testing the durability of the drills, Mr. Norris arrived at the following conclusions[4]:

When the speed and feed are constant the power required to drill cast steel is about 1.10 times, wrought iron about 1.65 times, and machinery steel about 1.90 times that required to drill cast iron; when the speeds and feeds remain constant the power rquired is approximately proportional to the diameter of the drill; when the diameter of the drill and rate of feed are constant the power required is approximately proportional to the speed; when the speed and diameter of drill are constant the power required is approximately proportional to the feed. The results include the power consumed by the machine as well as that required to do the work.

A law closely agreeing with these results when operating on cast iron at a speed of 30 feet per minute is:

$$\text{H.P.} = \frac{63}{\sqrt{d}}(dt + 0.01)$$

where d is the diameter of the drill in inches and t the feed in inches per rvolution of the drill.

Messrs. W. W. Bird and H. P. Fairfield, of the Worcester Polytechnic Institute, in a paper presented at the New York meeting of the American Society of Mechanical Engineers, December, 1904, gave the results of investigations, on the torque and thrust exerted on a 5/8-inch "Novo" high-speed steel twist-drill, having an included point-angle of 118 degrees, with varying rate of speed and feed on different metals. The results of these experiments may be briefly summarized:

No material difference, either in torque or end-thrust, was found by increasing the speed from 140 to 600 revolutions per minute when working on soft gray iron. When operating on the above material at 420 revolutions per minute at varying rates of speed, it was observed that the torque did not increase as quickly as the feed, whereas the thrust increased very rapidly with the coarser feeds.

To allow of a comparison with the experiments made at the Manchester School of Technology, these values are shown by the dot and dash line, Figs. 7 and 8.

TABLE II.—Bird and Fairfield's Experiments.

Feed, inches	1/250	1/167	1/125	1/100	1/83	1/71.5	1/62.5	1/55.5	1/50
Feed, per revolution	0.004	0.006	0.008	0.010	0.012	0.014	0.016	0.018	0.02
Total thrust, pounds	240	280	330	360	410	460	525	620	725
Total moment, inch-pounds	55	67	83	92	103	115	124	132	138

With a constant speed, diameter of drill and rate of feed the torque required when oprating on brass, tool-steel and machinery steel was respectively 0.715, 1.67 and 2.44 times that required for cast iron. The corresponding thrust relation was 0.575, 1.7 and 2.6. By varying the point angle of the drill from 75 degrees to 140 degrees, the end-thrust increased rapidly with the angle, but no practical difference was observable in the torque.

Conclusions From Early Experiments.

With a constant surface speed the thrust was nearly proportional to the diameter of the drill and also to the rate of feed. With different point angles the thrust decreased for angles from 150 degrees to 90 degrees, and then increased for any further decrease in the angles. The moment could not be said to be proportional to the angle of the point, but almost proportional to the feed. The drill giving the minimum torque had a point angle of 130 degrees and the torque increased with drills having angles greater or less than this.

The twisting moment for the ordinary twist-drills when plotted on a base of feed followed a law which was approximately expressed by:

$$T = 13.5\,d\,(t + 2.5)$$

where

T = Torque in inch-pounds; d = Diameter of the drill in inches; t = Feed in thousandths of an inch per revolution of drill.

The New Experiments.

In the experiments made at the Manchester School of Technology, which are now to be described, two forms of apparatus were used. The first was of a comparatively simple character, suitable for use in an ordinary lathe. The second apparatus was of a more elaborate kind, and certain defects which had shown themselves on the above-mentioned instrument were remedied in this. In the former case the drill was at rest and the work rotated, in the latter the work is fixed and the drill revolves.

Experiments With the First Apparatus.

The experiments had for their object:

(a) To determine the twisting moment required for drilling with different diameters of twist-drills at various speeds and feeds in cast iron and steel.

(b) The feeding force required was also determined for the curious conditions mentioned in (a).

(c) To ascertain the twisting force required to enlarge a hole (which had previously been opened with a drill of smaller diameter) at different rates of feed on cast iron and steel.

(d) The corresponding feeding force required under the circumstances instanced in (c).

Ordinary commercial Armstrong-Whitworth high-speed steel twist-drills of 3/4, 1 and 1½ inches diameter were used throughout these trials. The drills were ground on a twist-drill grinding machine and the point thinned to about half the thickness of the web. Particulars of the drills are given in Table III.

The cast iron operated upon was of medium hardness and had the skin removed. The steel was Whitworth's (fluid-pressed), of medium hardness, having 0.29 per cent carbon and 0.625 per cent manganese.

Apparatus Used in the First Series of Experiments.

The first series of experiments were made on an 18-inch screw-cutting lathe built by Sir W. G. Armstrong, Whitworth & Co., Manchester, where the work was held in the chuck and rotated with it. The arrangement is shown in Fig I.

The lathe was driven by a 120-horsepower, direct-current shunt wound motor with a speed variation from 100

[4] *American Machinist*, January 30, 1904.

TABLE III.—Particulars of Drills used in Second Set of Experiments.

Diameter of drill, inches. Intended.	Actual.	Pitch of spiral, inches. p	Tan a $= \frac{P}{\pi d} =$	Cutting angle at periphery. Degs.	Width of stem at root or backed off portion, inches.	Width of stem divided by diam. of drill, inches.	Width of chisel point, inches.	Width of chisel point divided by diam. of drill, inches.
0.75	0.749	1 in 5½	$\frac{5.5}{2.35} = 2.34$	66.9	0.117	0.156	0.085	0.114
1.0	0.999	1 in 6½	$\frac{6.5}{3.14} = 2.07$	64.25	0.166	0.166	0.096	0.096
1.5	1.501	1 in 10	$\frac{10}{4.71} = 2.12$	64.8	0.266	0.177	0.170	0.113
2.0	2.002	1 in 14	$\frac{14}{6.28} = 2.23$	65.8	0.349	0.175	0.191	0.096
2.5	2.501	1 in 18	$\frac{18}{7.85} = 2.29$	66.4	0.384	0.154	0.200	0.080
3.0	3.003	1 in 21	$\frac{21}{9.43} = 2.23$	65.8	0.399	0.133	0.224	0.075
Average	.....		2.23	65.8		0.160		0.096

to 300 revolutions per minute. The motor drove a countershaft whereon was mounted a three-step cone similar to that on the lathe spindle. A further reduction of speed could be obtained through the double and triple gears in the machine, the ratio of which was 14.9:1 and 42.5:1, respectively. The combined arrangement thus permitted of the speed being varied from 1.5 to 450 revolutions per minute. A counter fixed to the tail of the spindle indicated the revolutions made by the work.

The stand A, bolted to the bed of the lathe, supports the drill close to the work. The drill is free to slide in the bearing provided in the stand. Suitable hardened steel bushes are used for the various sizes of drills. A small socket B receives the tang of the drill and the thrust on it is taken by the knife-edged lever C and a diaphragm dynamometer fitted to a cast iron block bolted to the top slide rest.

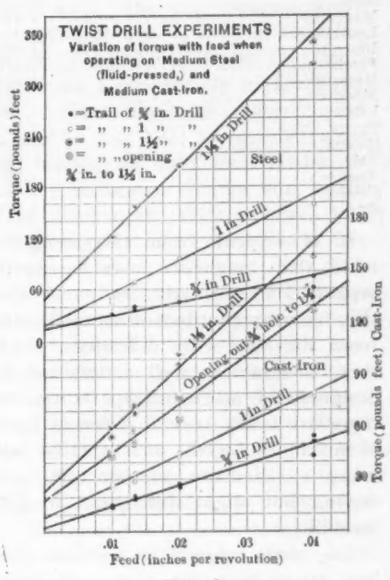

TWIST DRILL EXPERIMENTS
Variation of torque with feed when operating on Medium Steel (fluid-pressed,) and Medium Cast-Iron.
•=Trail of ¼ in. Drill
○= " " 1 " "
⊕= " " 1½ " "
◎= " "opening ¼ in. to 1½ in.
Torque (pounds) feet
Torque (pounds feet) Cast-Iron
Steel
Cast-Iron
1½ in. Drill
1 in. Drill
¼ in. Drill
Opening out ¼ hole to 1½"
Feed (inches per revolution)

Fig. 2.

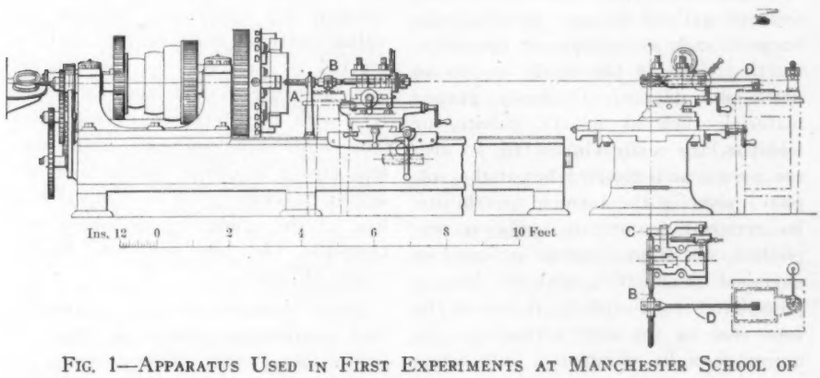


Fig. 1—Apparatus Used in First Experiments at Manchester School of Technology.

The arm D is clipped and cottered at one end to B, while the other extremity, resting on a scale pan, prevents the drill from rotating. As the arm advances with the drill and the scale pan is stationary, the former is fitted with a knife-edged roller to reduce side twist on the drill due to friction. The force exerted on the pan when multiplied by the length of the arm gives the twisting moment on the drill. On the engagement of the screw-cutting feed mechanism a definite advance is given to the saddle and drill per revolution of the work. The diaphragm dynamometer is similar to that shown in section in Fig 6 and described in the second apparatus. The speed in the ordinary force trials was kept constant at 10 revolutions per minute for each diameter of drill. The revolutions were observed on the counter at the end of the lathe spindle and a tachometer on the motor.

No perceptible difference was observed in the twisting moment and end-pressure with the variation of speed; that is, the cutting horsepower for a given diameter of drill and feed was directly proportional to the speed.

(To be continued.)

New Freight Rates.—The new transcontinental freight rate on pig iron from eastern iron centers to the Pacific coast terminals has been announced effective May 25, according to Supplement No. 7 of the West Bound Tariff No. 4-D issued by the Transcontinental Freight Bureau. The new rates are applicable to almost all points east of the Mississippi river. The rate is $10.00 per net ton in carloads and $20.00 per net ton in less than carloads. The minimum carload weight is 60,000 pounds. From points in the northern peninsula of Michigan, Wisconsin, Minnesota, Illinois, Iowa and Missouri shown on pages 1 to 6 of the tariff the rate is $9.00 per ton of 2,240 pounds. Shipments of American iron to the Pacific coast are expected to experience a considerable increase as soon as the new rates go into effect. The new rates place American irons practically on a par with the imported European product.

Freight rates on pig iron from Missouri river points to Utah, which are considered excessive, are being discussed by foundrymen at Salt Lake City. The Commercial club will be asked to take the question up with the railroads for possible readjustment from the present $12 a ton basis.

Blast furnace E of the Bethlehem Steel Co., was blown in April 16.

THE CONCENTRATION OF LOW GRADE MAGNETIC IRON ORES[1]

By G. C. Mackenzie, Kingston, Ont.

In November, 1907, the writer received instructions from T. W. Gibson, deputy minister of mines for Ontario, to make a report on "The Iron and Steel Industry of the Province," with special reference to the problem of concentrating and preparing for blast furnace use the low grade magnetites of the eastern and northern townships. In this connection, it was deemed advisable to visit several of the larger American magnetic concentrating mills, where the process has been in operation for some years, and at the same time, whenever possible, to witness the operation of American blast furnaces burdened with these concentrated ores.

Accordingly visits were made to the mills at Mineville, N. Y., operated by the Witherbee Sherman Co., and to the Cedar Point furnace at Port Henry, N. Y., where Mineville concentrates are almost exclusively used; to the separating plant at Lyon Mountain, N. Y., operated by the Delaware & Hudson railroad, and to the Standish, N. Y., furnace, which takes a large portion of the output of Lyon Mountain mill; and finally to the plant of the Pennsylvania Steel Co., at Lebanon, Pa., where the low grade Cornwall ores are concentrated, and subsequently nodulized before being smelted. Description of these plants will be found in the seventeenth (1908) report of the Ontario bureau of mines, the descriptions being accompanied by cuts of the various mills, descriptive data, chemical analyses, etc., illustrating the results obtained.

The problem of concentrating low grade Canadian magnetites by means of magnetic separating machines has been discussed from time to time in various papers read before the institute. These papers contain much valuable information on the subject, giving detailed descriptions of many different types of separators used on this continent and abroad. In the present instance, no attempt will be made to describe any particular process or separator, but rather to present in general some of the more important features of the problem under consideration.

The basis of all magnetic concentration is the fact that different mineral species possess different ratios of permeability. The more permeable a mineral is, the stronger the tractive force exerted upon it by the electro magnet, and *vice versa*. Exhaustive experiments to determine the relative permeability of different minerals have been carried out by Walter Crane. His methods of determination, with full tabulated results, are given in the Transactions American Institute of Mining Engineers, Vol. XXXI, page 405. The following list of the more common minerals is taken from Mr. Crane's monograph.

Magnetic Permeability of Some Common Minerals.

Note.—Permeability of air assumed to be unity.

Mineral.	Permeability.
Iron	2.1617
Steel	2.1532
Magnetite	1.4669
Franklinite	1.4112
Ilmenite	1.2871
Pyrrhotite	1.0782
Hematite	1.0242
Siderite	1.0234
Limonite	1.0099
Pyrite	1.0064
Quartz	1.0055
Talc	1.0039
Apatite	1.0026
Calcite	1.0040
Barite	1.0000

It is evident from the foregoing table that magnetite may be easily separated from quartz, pyrite, or apatite, from pyrrhotite not so easily, and from ilmenite with difficulty. However, this fact is well understood by designers of magnetic separators, and there are today several different types of machines on the market that will make a separation of minerals, possessing but slight differences in permeability.

The main object in concentrating low grade magnetic iron ores is, of course, to increase the iron content as much as possible, and at the same time to get rid of any harmful substances, such as sulphur or phosphorus, that exist in the crude ore to an obnoxious degree. Ordinary gangue material, such as quartz, calcite, or feldspar, are easily eliminated, so also are pyrite, and apatite; but if the sulphur exists in the form of pyrrhotite, its removal is not so easily accomplished, and if phosphorus is found in chemical combination with the iron as phosphate or phosphide, it cannot be separated by the electro magnet. Titanium can be eliminated only when that element is present in the form of titanite. If it exists as ilmenite, there is no chance of its successful separation from magnetite on a commercial basis.

There is, however, another feature of this problem which is of equal importance to the chemical composition of the ore, and that is its crystalline structure. Ores that are coarsely crystalline are easily disintegrated by crushing, the constituent minerals falling apart without forming any excessive amount of dust particles, so that when subjected to the separation process the heads product is not only clean but is coarse enough for direct use in the blast furnace. Magnetites of this class are being concentrated at Mineville, the concentrated product averaging 65 per cent larger than 10 mesh. On the other hand, ores of finer crystallization require more pulverizing to effect a complete disintegration of the constituent minerals, and the crushed material containing considerable dust is concentrated with more difficulty, yielding a heads product that is in general too finely divided for blast furnace use. Magnetites of the latter class are being treated at Lyon Mountain, N. Y., the concentrates in this case averaging 8 per cent larger than 10 mesh, 50 per cent between 10 and 40 mesh, with 42 per cent smaller than 40 mesh. The use of these concentrates at the Standish furnace gave considerable trouble until a nodulizing plant was installed for the purpose of agglutinizing the fine material.

Both the Mineville and Lyon Mountain mills are operated dry. The crude ore after being crushed to small size is heated in vertical dryers to expel moisture. The preliminary drying, although expensive, is necessary for efficient dry separation, because individual particles must be free to be attracted or rejected by the magnets, and moisture would seriously interfere with this freedom of movement. The mills are equipped with heavy and costly crushing, sizing and conveying machinery for economical handling of the crude ore of which some thousand and odd tons are handled every 24 hours.

Ores of extremely fine crystallization, containing pyrites or other objectionable gangue minerals finely disseminated require excessive pulveriza-

[1]A paper read before the Canadian Mining Institute, Montreal, March 3-5, 1909.

tion to liberate the particles of pure magnetite. Such pulverized material is difficult to concentrate dry on account of the amount of dust, fine particles of gangue being carried into the heads entrained with particles of magnetite. This difficulty is overcome by mixing the material with an excess of water and allowing it to flow underneath the poles of a strong electro magnet, the particles of magnetite being lifted out of the wet pulp without entraining any undue proportion of gangue particles.

The process of wet separation is in operation at the Lebanon plant of the Pennsylvania Steel Co., the concentrates obtained being in a fine state of subdivision are partially dewaterized and then nodulized in long tubular kilns using powdered coal for fuel.

There are, then, two distinct systems of magnetic separation. First, the dry process, which may be applied to ores of fairly coarse crystalline structure requiring the crude ore to be thoroughly dried before it can be handled by the separating machines. In following this method of concentration it is usual to carry the preliminary crushing just far enough to free the average sized particles of pure magnetite. The crushed ore is then sent to the separators, making a three part separation; concentrates that require no further treatment; tailings depending on their iron content, may be disposed of as waste, and middlings consisting of particles that are half magnetite and half gangue requiring a second crushing and separation. This secondary separation may be followed by a third and possibly a fourth similar operation, until the iron content of the final tails falls below the economical point of recovery. Concentrates produced by this method may or may not require briquetting or nodulizing, depending on the fineness of the material. The wet process is more particularly applicable to ores that require much grinding to free individual particles. No partial crushing is necessary in this case, and as the process is carried out with the aid of a considerable amount of water, preliminary drying is of course obviated. In practice the ore is reduced to medium size in large rock breakers and is then fed to wet ball mills that discharge the finely disintegrated pulp to the magnetic separators. The separators as a rule make but two products, concentrates and tailings, and are usually so adjusted that the tails are uniformly low in iron, being then discharged to the waste dump. The concentrates obtained may be accepted as a final product, or if a higher iron content is desired, they may be reground in ball mills or tube mills and subjected to secondary concentration. The final concentrates are then partially freed from water, and as they are much too fine for direct use in the blast furnace they must be either briquetted or nodulized.

The most successful system for briquetting and desulphurizing small iron ores is undoubtedly the Swedish Grondal process described by P. McN. Bennie, in Vols. X and XI of the Institute Transactions. Mr. Bennie has explained this method so well that it need not be enlarged upon here and those requiring full details are referred to Mr. Bennie's interesting paper.

The nodulizing process is to date the most successful American method of sintering concentrates, flue dust, and small ores generally, forming small nodular masses of the material treated. Briefly described the process consists of feeding the finely divided ore into the upper end of an inclined rotary kiln. The kiln rotating slowly on its longer axis is fired at its lower extremity by blowing in coal dust, generating an extremely high temperature. The fine ore sintered into masses by the heat is tumbled about and broken up into nodules by the rotating movement of the kiln, finally being discharged at the lower end. The Pennsylvania Steel Co. have four of these kilns installed at their Lebanon plant, treating the concentrated magnetite from the separating mill. The concentrates as fed to the kilns average 61 per cent in iron with 1 per cent of sulphur. The nodules produced contain between 58 and 60 per cent of iron with only 0.03 per cent of sulphur, showing that the kilns are efficient desulphurizers, and also that the Fe_3O_4 in the concentrates, is partially oxidized to Fe_2O_3 in the nodules. With all four kilns in operation the plant produces daily about 400 tons of nodules which are quite hard and porous, 80 per cent of the product being larger than ¼-inch and nothing is finer than 12 mesh. Hence it makes a most desirable material for the blast furnace.

The coal consumption at Lebanon, per gross ton of nodules, will average, it is said, 8 per cent, this being 1 per cent in excess of the fuel consumption claimed for the Grondal briquetting furnace. However the unit capacity of the nodulizing kiln exceeds the unit capacity of the Grondal furnace, and the cost of installation is much lower in the case of the former.

That magnetic concentrates, if *properly prepared,* are ideal for use in the blast furnace is freely conceded by practical iron men. The slag forming ingredients are uniformly low and the iron content will vary but slightly from time to time. Any deleterious element such as sulphur or phosphorus that existed in the crude ore being reduced to uniformly low percentages, that will give but little trouble in smelting. These points are keenly appreciated by furnace men for they mean a greater yield of pig iron per ton of ore, resulting in lower fuel consumption, a more even running furnace because the chemical and physical conditions of the ore are not subject to extreme variation, and consequently a greater output of pig iron at a lower cost.

During the year 1907, iron blast furnaces in Ontario consumed 508,883 gross tons of ore; of this amount 76.3 per cent was imported from the United States and 23.6 per cent was mined within the province. These figures clearly illustrate the present status of iron ore mining in Ontario and convey the impression that our iron ranges are limited in extent. We have one mine, the Helen, in Michipicoton, that is worked on a scale approaching modern requirements. The ore being a non Bessemer brown hematite, is for the most part exported to the United States in exchange, as it were, for American Bessemer ores which are greatly in demand at Ontario furnaces. A large body of magnetite at Moose mountain, north of Sudbury, is being exploited and promises to be importantly productive; this ore is, however, also of non-Bessemer grade. The Atikokan mine, 130 miles west of Port Arthur, was worked for some time in 1906-1907, the high sulphur magnetite produced being roasted and subsequently smelted in the Atikokan blast furnace at Port Arthur. The furnace going out of blast in December, 1907, has stopped mining operations since that date. In eastern Ontario, the Canada Iron Corporation, Ltd., are working deposits of magnetite at Bessemer, the ore after hand sorting being of Bessemer quality. The corporation also control the Eganville deposits, but at present are not working the mine. There are numerous deposits of low grade ores along the Central Ontario and Kingston and Pembroke railways. On the Central Ontario may be mentioned Coe Hill, Belmont, and Blairton, also several of the ore bodies at Bessemer. Along the Kingston and Pembroke railway the most conspicuous are the

Calabogie, Robertsville, Flower, Wilbur and Glendower deposits. All of these mines have been worked at some time or another, the operators taking out the richer pockets that required little or no sorting, mining being discontinued when any considerable amount of poor ore was encountered. In the northern part of the province are found the banded jaspilyte ores as at Temagami station. Also the finely crystalline silicious magnetites of the Hutton range. Magnetites of the latter types are found in abundance on the eastern shores of Lake Nipigon; they also occur to some extent around Lake Temagami and in the township of Boston.

It is evident then that while our known supply of rich ore is limited, we have numerous deposits of low grade material that is of little or no value commercially in the crude state, but which might prove a valuable asset if means were employed to concentrate the iron values and to eliminate impurities. Examples have been cited of what the Americans are doing with their low grade ores in New York state and in Pennsylvania. Also Mr. Bennie has given reliable data on the methods that are followed in Sweden in treating ores similar in character to our own. Therefore, it may be permissible to conclude that successful concentration of our Ontario ores can be carried out, if wise selection is made as to the general adaptability of any process to meet local requirements.

Successful concentration does not, however, spell profits in dollars and cents. An ore may present an easy concentrating problem, and the product of the mill find a ready market, but the financial success of the undertaking will be doubtful, unless the cost of the crude ore and its iron contents as magnetite are commensurate with the cost of producing a ton of concentrates from the crude. The following example will make this more intelligible: Assume a concentrating mill to have a capacity of 1,000 tons of crude ore daily, the running expenses of the plant remaining constant at $300 per diem. This mill is treating a certain ore (A) containing 60 per cent of magnetite (43.45 per cent iron), that is costing delivered at the mill $1.25 per ton; producing concentrates containing 90 per cent magnetite (65.178 per cent iron) with a loss of 4.5 per cent magnetite (3.26 per cent iron) in the tailings. The number of crude units required to make one concentrate unit will be theoretically $\frac{90-4.5}{60-4.5} = 1.54$, therefore 1,000 tons of crude ore will yield $\frac{1,000}{1.54} = 649$ tons of concentrates. The cost of these concentrates for milling is $\frac{\$300}{649} = 46.2$ cents per ton, to which must be added $\$1.25 \times 1.54 = \$1.92.5$, the cost of the crude ore necessary to make one ton of concentrates, making a final cost of $2.38.7 per ton of product.

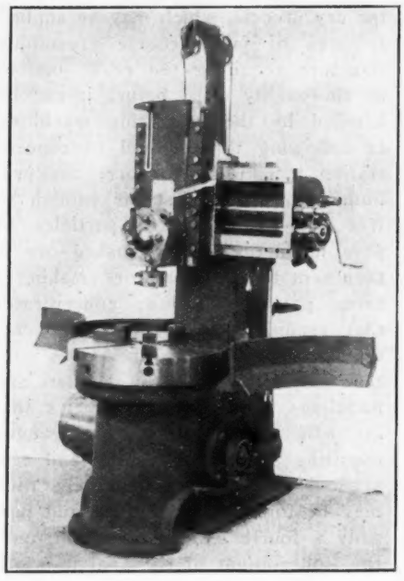
A second ore (B) costing the same ($1.25) per ton delivered, contains only 40 per cent of magnetite (28.97 per cent iron). This ore is concentrated with the same efficiency as the first, making a concentrate containing 90 per cent of magnetite, and with a loss of 4.5 per cent of magnetite in the tails. In this case $\frac{90-4.5}{40-4.5} = 2.4$ units of crude ore required per unit of concentrate, therefore 1,000 tons of crude ore will yield only 416 tons of concentrates, at a milling cost of $\frac{\$300}{416} =$ 72.1 cents per ton; adding to this the cost of crude ore, $\$1.25 \times 2.4 = \$3$ per ton, the final cost of producing concentrates from ore (B) will be $3.72.1 per ton of product. Hence it is apparent that if the final costs of the concentrates produced from ore (A) is allowing a reasonable profit, the price paid for ore (B) should be reduced from $1.25 to $\frac{2.38-72.1}{2.4} = 69.4$ cents a ton to admit of making an equal profit in the second case.

There are of course other factors that will influence the final cost of concentrates, as for instance, the rate at which a given ore may be crushed and passed through the separators. But the predominating conditions for success or failure will always be governed by the cost of the crude ore, and its iron content as magnetite.

During the spring of 1908 a few preliminary tests on magnetic concentration of Ontario ores were carried out by the writer for the bueau of mines, and the results obtained, although not conclusive, were encouraging. Descriptions of these tests will be found in the seventeenth report before mentioned. At the present time the writer is conducting separation tests for the bureau on a larger scale at the Kingston School of Mines, three ton samples of low grade magnetites having been secured from five different localities, making a fair representation of the different types of low grade ores met with in Ontario. These ores are being tested for separation efficiency by both dry and wet methods of concentration, and it is hoped that the results will prove of interest and possibly of some value to the iron industry of the province.

A NEW VERTICAL BORING MILL.

We illustrate an improved design of the 34-inch boring mill built by the Colburn Machine Tool Co., of Franklin, Pa. In much of the work done in small and medium-sized boring mills, it is necessary to use a lubricant of some description, and the speeds in which these machines and their work are run cause a distribution of more or less of the lubricant over the operator and the surrounding floor. The design illustrated is intended to avoid this difficulty by providing a suitable guard surrounding the table, and it is so designed that the front half will open outward and away from the work and table, leaving the front of the machine entirely clear for placing and removing work.



COLBURN VERTICAL MILL.

The Southern Iron & Steel Co., which was organized in New Jersey with a capital of $17,000,000 to take over the Southern Steel Co.'s properties, is to pay a franchise tax of $1,500,000. M. L. Bonner is state agent with offices in the Brown-Marx building, Birmingham. E. K. Campbell, also of Birmingham, is attorney.

CROSS COMPOUND ENGINE FOR THE TENNESSEE COAL, IRON & RAILROAD CO.

BUILT BY THE C. & G. COOPER CO., MT. VERNON, O.

In these days when gas engines and steam turbines are attracting so much attention, it is interesting to note that the Corliss engine in the field of large electric generating units still holds its own with many of the leading power users of this country and Europe. One of the notable plants of this type is the one recently furnished the Tennessee Coal, Iron & Railroad Co., Birmingham, Ala., by the C. & G. Cooper Co., Mt. Vernon, O. The engine is of the cross-compound type with cylinders 42 inches and 78 inches diameter, 54-inch stroke, and will be direct-coupled to a 2,500-kilovolt-ampere, Crocker-Wheeler alternator in the electric power house at the Ensley works. In the contract for this engine delivery was promised in four months after receipt of complete information. Shipment was made on March 4, fully 40 days before the date promised. This in itself is an achievement worthy of note, as it means that the engine was practically constructed in 80 calendar days.

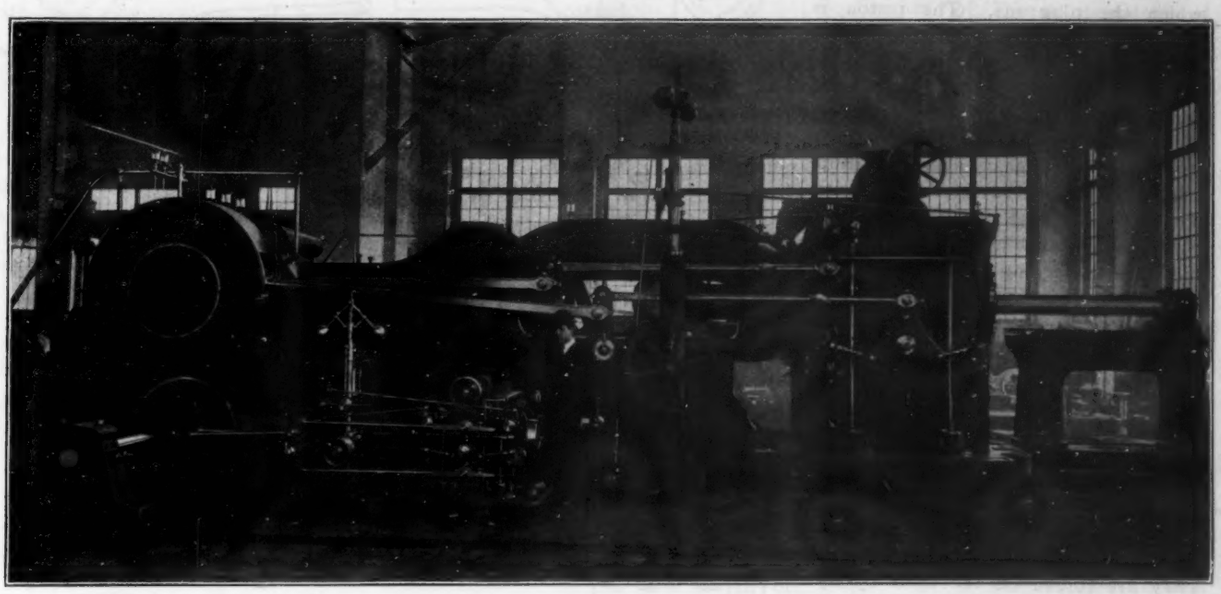


FIG. 1—HIGH PRESSURE SIDE OF THE TENNESSEE ENGINE ON ONE OF THE ERECTING FLOORS AT THE COOPER COMPANY'S WORKS.

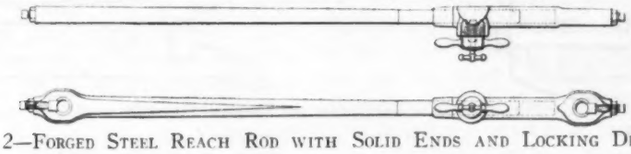


FIG. 2—FORGED STEEL REACH ROD WITH SOLID ENDS AND LOCKING DEVICE.

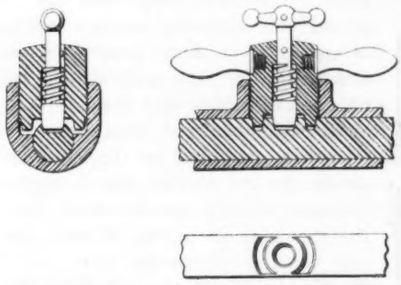


FIG. 3—DETAIL OF COOPER LOCKING DEVICE FOR DISCONNECTING VALVE GEAR FROM ECCENTRICS.

This unit will be placed in continuous heavy service, and is, therefore, proportioned for a large overload capacity, and will develop 4,000 indicated horsepower continuously when called upon to do so. The valve gear is of the Cooper improved and simplified type, which has tested successfully in rolling mill and electrical work. The high pressure side of this engine is shown in Fig. 1 in process of erection at the Cooper works. The proportions of the engine are emphasized in a striking way by the contrast afforded by the smaller engine shown alongside, and which is 8-inch by 24-inch, 50-horsepower engine built for the Franklin Foundation, of Boston. The photograph also gives a very good general idea of the valve gear, main and supplementary crossheads and bed plate. The sub-base of the deep base plate running underneath the engine insures proper alignment. All valves are double ported and the governor controls the steam admission from zero up to 75 per cent of the stroke. The valve gear parts, such as bell cranks, valve arms, etc., are steel castings, and all bearings about the gear, including those for the valve stems are lined with phosphor-bronze bushings grooved for lubrication, contributing to reduced friction and extended life. In this design the Cooper company has departed from the usual conventional type of ends on the eccentric rods and

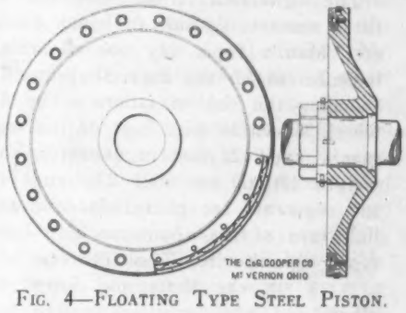


FIG. 4—FLOATING TYPE STEEL PISTON.

reach rods, and they are forged solid in open-hearth steel with adjustable phosphor-bronze bushings as shown in Fig. 2. A detail of the locking device in the reach rod is shown in Fig. 3. By means of this lock the valve gear is disconnected from the eccentrics and placed under the control of the operator. The features of this lock are its ease of operation and freedom from lost motion, owing to the concentric tapered grooves into which the plug fits. The piston is shown in Fig. 4, and is a steel casting, coniform in section, floating on a hollow piston rod carried by the main and supplementary crossheads. It is fitted, as will be noted, with two narrow packing rings, which constitute the only contact with the cylinder. The general design of the connecting rod is shown in Fig. 5. It is a solid open-hearth forging with eyes slotted out to receive boxes and adjusting wedges. It will be noted that the arrangement of these wedges tends towards the maintenance of a constant rod length. The crosshead end boxes are of solid brass and those in the crank end are steel castings lined with hard babbitt, and the adjustments for both are accessible and easily made. The cranks are of the balanced disc, double web type, as shown in Fig. 6. They are forced on the shaft by hydraulic pressure and keyed in place. The pins are pressed in and riveted over. The crank and crosshead pins, and in fact all working bearings about the engine, including the valves and valve ports are ground and polished to smooth true working fits.

The main crosshead design is shown by Fig. 7. The body is a steel casting of the box type, and the shoes are adjustable by means of liners avoiding the use of wedges or wedge bolts. The shoes are held in place by means of tapered lock bars betwen the crosshead and the lugs on the shoes. The faces of both top and bottom slippers are babbitted and turned. The double key construction is used to connect the crosshead to the piston rod.

The governor drive consists of three separate strands of 1-inch diameter Manila rope, any one of which is sufficient for the duty, thus greatly reducing the risk of failure. The fly wheel, shown in Fig. 8, is of the segmental type, 22 feet in diameter, and weighs 170,000 pounds. The ends of the segments are planed fits and the links are of the countersunk, T-head type shrunk in. The centers are pressed on the shaft and keyed in place, and each arm is secured between the centers by three fitted and driven bolts. The engine is of the same capacity and is similar in all essentials to that installed by the

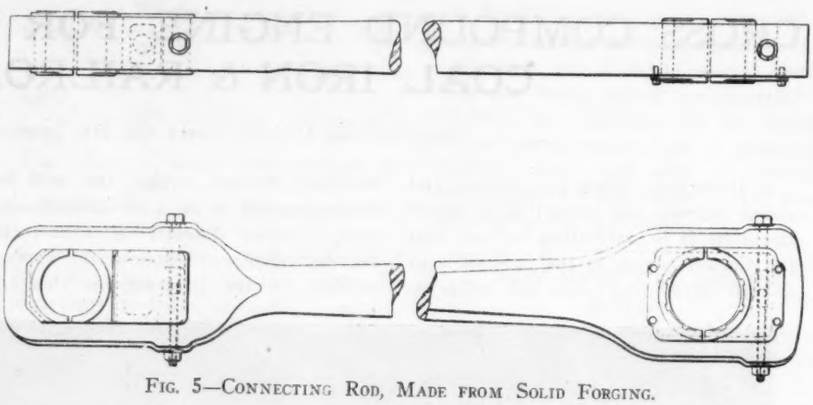


FIG. 5—CONNECTING ROD, MADE FROM SOLID FORGING.

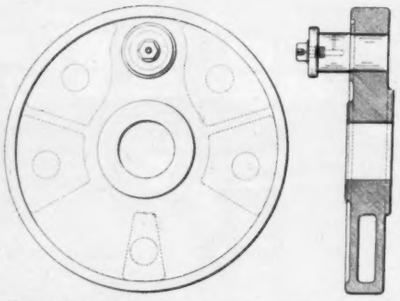


FIG. 6—BALANCED DISC DOUBLE WEB TYPE CRANK.

Cooper company at the Carnegie Steel Co.'s Duquesne works about 15 months ago, and which is also driving a 2,500-kilovolt-ampere Crocker-Wheeler alternator in the new blast furnace power house, and has been in constant service since its erection. A third engine of this series is now being installed by the Cooper company in the Packard Motor Car Co.'s works, Detroit, where it will drive a 2,500-kilowatt Western Electric direct-current generator.

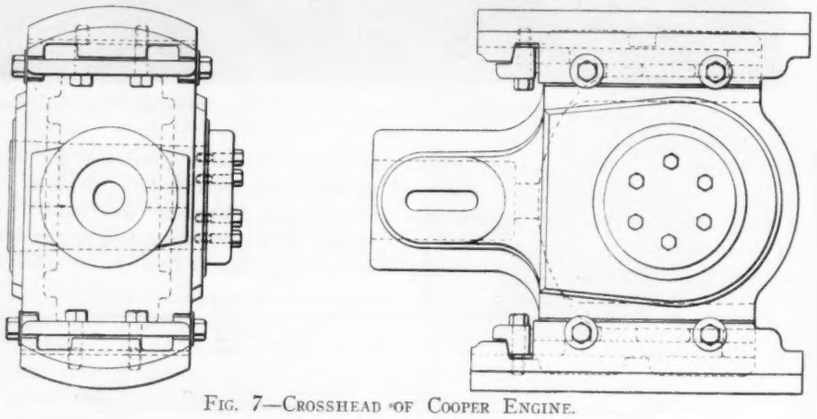


FIG. 7—CROSSHEAD OF COOPER ENGINE.

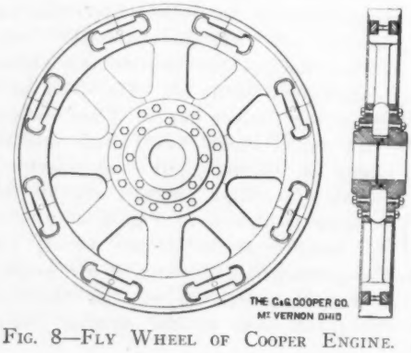
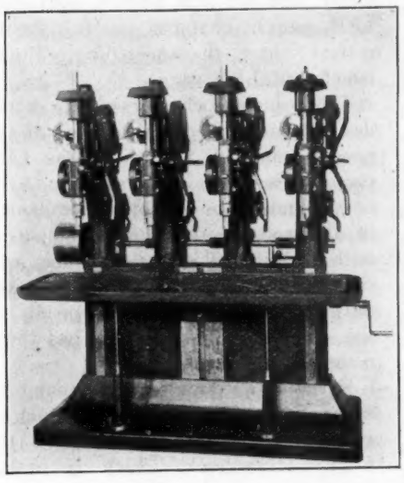


FIG. 8—FLY WHEEL OF COOPER ENGINE.

THE BARNES DRILL CO. ALL-GEARED 20-INCH GANG DRILL.

We illustrate a new design of four-spindle gang drill built by the Barnes Drill Co., Rockford, Ill., in which neither cone nor feed belts are employed. Each spindle has four changes of speeds when direct geared, or eight changes when back geared, and positive power feeds range from 0.001 inch up to 0.025 inch per revolution. The feeds are controlled by the small lever shown on the ratchet faced segment. Changes of both speeds and feeds and the throwing in or out of back gears can be done from the front of the machine without stopping the spindle. In common with all all-geared machines, there is no shifting or mending of belts. Although all four spin-

dles are driven from a single shaft, any spindle may be stopped by moving the speed changing lever to the center, throwing the transmission gears out of mesh. The drift hole is placed below the sleeve, so that the tool may be drifted with the spindle in any position. Additional stiffness to the head of the machine is contributed by a back brace and the gearing and spindles are extra heavy. The machine, as shown, is of the box column type, and is fitted with a single



BARNES ALL-GEARED GANG DRILL.

table supported by two screws by which it is also elevated or lowered, and giving a substantial support in addition to the clamping arrangements provided. The machine is also built with independent columns with separate tables, either round or square, and either style can be built with two, three, four or six spindles. For tapping, any or all spindles may be fitted with levers or friction clutches. The cut shows the right hand spindle so fitted. The machine illustrated will drive drills up to 1-inch diameter in steel without the back gears, or 1½ inches in steel with back gears in, and will drive a 2-inch tap in cast iron.

Under an agreement reached between the receiver of the Dering Coal Co. and the Illinois Steel Co. and the American Steel & Wire Co., the two steel companies have paid $201,600 to the receiver on account. The coal company alleges the combined accounts of the two steel companies amount to $213,733.

The Norfolk & Western shops at Roanoke, Va., for the first time in their history will begin construction work on 300 all-steel cars shortly.

STRONG SENTIMENT

IN FAVOR OF ORGANIZATION OF EMPLOYERS

Displayed at Convention of United Metal Trades Association of the Pacific Coast at Seattle—Training Apprentices Discussed.

A strong, broad-minded association of employers, including not only the metal trades but the lumbermen, builders, contractors, printers, public service corporations and all employing interests, should be organized on the Pacific coast and endowed with the necessary power to deal effectively, economically and justly with the labor problems of the Pacific northwest. In the perfection of this organization, the metal trades should be pioneers and should give to the work their active, enthusiastic co-operation and support. Such an association, wisely administered, would be of immense benefit to the industrial health and progress of the Pacific coast. This was one of the important decisions reached at the third annual convention of the United Metal Trades Association of the Pacific coast, held at Seattle, Wash., Saturday, April 24. Not less important was the strong sentiment expressed on the floor of the convention, and also by President Sumner, that the foundrymen of the northwest are in favor of purchasing American instead of imported European or Chinese pig iron whenever the prices of the two materials are such that this can be done without serious inconvenience and loss. The Pacific coast is not a consumer of large quantities of European iron from choice but because heretofore the domestic irons have been so high in price as to make their regular purchase impossible. The recent reductions in the transcontinental freight rate make the prices of domestic and foreign iron practically the same. Under these conditions, the Pacific coast foundrymen favor domestic iron, not only for patriotic reasons, but because it is more uniform in quality and more frequent and certain in delivery. Judging from the sentiments expressed at the convention the consumption of American iron on the Pacific coast is destined to experience a considerable increase in the near future. It was even suggested that the foundries, if possible, adopt the policy of using low grades of pig iron in place of scrap and thus bring the price of scrap on the Pacific coast down to a reasonable figure. If this were carried into effect, it would increase the annual consumption of pig iron on the coast by 40 per cent.

Election of Officers.

The convention was called to order at 10:30 A. M. in the new chamber of commerce in the Central building. T. B. Sumner, of Everett, president of the association, occupied the chair. Fifty per cent of the firms on the membership roll were represented at the meeting, some by two or more delegates.

The election of officers took place at the close of the afternoon session. As was announced by telegraph in the April 29 issue of THE IRON TRADE REVIEW the following were unanimously chosen: President, O. E. Heintz, manager Pacific Iron Works, Portland, Ore.; first vice president, Gilbert Hunt, president Gilbert Hunt Co., Walla Walla, Wash.; second vice president, George James, president Variety Iron Works, Seattle, Wash.; third vice president, Niven McConnell, president McConnell Engineering & Machinery Co., Tacoma, Wash.; secretary - treasurer, Albert Smith, Smith & Watson Iron Works, Portland, Ore.; commissioner (appointed), H. S. Hastings, Seattle, Wash.

The secretary and treasurer's report showed that eight new members were added during 1908. Under existing financial conditions and considering the comparatively few iron trade industries in the west this is an excellent record. Opening the membership of the association to sheet metal firms was suggested but no action was taken. The financial report showed excellent conditions. The association began the year with a debt incurred in fighting the molders' strike; this has been paid off, leaving a balance in the treasury on March 31, 1909.

Report of the Commissioner.

The important feature of the morning's program was the report of the commissioner, H. S. Hastings. Mr. Hastings congratulated the membership on the excellent financial condition of the association. He said there were no labor troubles of consequence in 1908 and announced that through the efforts of the association the iron molders' strike was officially called off in February, 1909. Mr. Hastings warned the association, however, against the activities of the ma-

chinists' union. There are three organizers from the machinists now at work on the coast, including one of the vice presidents of the union.

The activities of the association in behalf of a lower tariff on pig iron, scrap, coke and iron ore were detailed by Mr. Hastings, who said that the reduction in the ore duty would encourage the local manufacture of pig iron.

The association has taken an active part in the subject of freight rates and was the first western metal trades organization to appear before the transcontinental freight bureau and plead the cause of the Pacific coast manufacturer. In this matter, the California Metal Trades Association actively co-operated. One of the direct results of this meeting with the transcontinental freight bureau, which took place in Chicago in January, was the recent reduction in the freight on pig iron.

Mr. Hastings outlined the scope of the machinery and foundry exhibit at the Alaska-Yukon-Pacific Exposition, detailed the activities of the association in the cause of industrial education, and concluded with a strong plea for a wideawake employers' association on the Pacific coast. A general discussion of the employers' association idea concluded the morning session.

At noon the delegates in attendance and their invited guests enjoyed an informal luncheon at the New Washington hotel.

The Afternoon Session.

This session was devoted to the discussion of topics of interest to the members and to the election of officers for the ensuing year. The results of the election are given earlier in this article.

J. H. Linnton, American Chemical Society, and chemist for the Vilter Mfg. Co., Milwaukee, read an interesting paper, entitled "Chemistry as Applied to Foundry Practice." Mr. Linnton gave convincing evidence and cited numerous examples of the economy of cupola control by chemical analysis.

The bulk of the afternoon session was occupied in discussions bearing on the apprenticeship problem. E. O. Eastwood, professor of mechanical engineering, University of Washington, read a paper outlining the scope of the courses in industrial education offered by the university. These courses are sharply differentiated from the regular engineering work and are designed to train mechanics, not engineers. The entire equipment of the university is at the disposal of the students and no tuition is required.

Harold A. Woodcock, educational director Y. M. C. A., detailed a very interesting plan for the training of apprentices through the co-operative effort of the Y. M. C. A. industrial school and the manufacturers of the city. The plan outlined is modeled on the now famous Cincinnati university system of co-operative engineering instruction. The apprentices are to work in groups of two, one boy in the school while his mate is in the shop and vice versa, so that for the first two years the apprentice will spend half of his time in the school and half in the shop; the last two years of the proposed four-year course are to be devoted entirely to shop practice. The aim of the course is to correlate the work in the school and in the shop so as to produce the most efficient journeymen mechanics. The idea met with considerable favor and President Heintz was directed to appoint a committee to work in conjunction with Mr. Woodcock and formulate a working plan.

Frank Hanford, of Hanford & deVeuve, Seattle, read a paper on the merits of employers' liability insurance and advantages of accident insurance carried by employers for their employes. The relation of the state factory laws to liability insurance rates was thoroughly discussed.

In the interval between the afternoon and evening sessions, the delegates and their guests enjoyed an extended automobile ride, visiting several points of interest in the city.

Banquet.

The evening session was in the form of a dinner served at the New Washington hotel. The evening was largely devoted to social enjoyment. T. B. Sumner, the retiring president of the association, was toastmaster. The chief speaker and guest of the evening was I. A. Nadeau, director general Alaska-Yukon-Pacific Exposition. Mr. Nadeau spoke in an illuminating and comprehensive manner on the mechanical and engineering features of the exposition.

The new executive council of the association consists of the recently elected officers and the members of the three district committees. These committees will be elected at the several district meetings to be held in the near future. The first meeting of the new council will probably be held some time in June.

THE COPPER HANDBOOK.

The eighth annual edition of the Copper Handbook, just issued by the author, Horace J. Stevens, of Houghton, Mich., is at hand. It is an octavo volume of 1,500 pages, in brevier type, but by slight increases in the width and height of the printed matter on each page, together with a reduction in the leading, but without using a smaller face of type, each page carries one-third more matter than formerly, and the new edition, with only 1,500 pages, contains one-half more matter than the preceding edition, which had 1,228 pages.

The principal chapter of the book, devoted to detailed descriptions of the copper mines of the globe, has 1,185 pages, describing no less than 6,767 copper mines and copper companies, in all parts of the world, comparing with 4,627 listed in the preceding edition. This long chapter, which was unrevised in volume VII, owing to fire, accident and illness, has been completely rewritten.

Rarely is a single work found of such general importance to such a great diversity of interests as is the Copper Handbook, which is practically an encyclopedia of the entire subject of copper, and, as such, is of equal interest to miner, metallurgist, refiner, producer and consumer. To the investor or speculator in copper shares, it is as nearly indispensable as a work of reference can become. As usual, the Copper Handbook is exceedingly frank in its comments, and the descriptions of mining companies considered by the author to be dishonest, are marked by the utmost limit of plain-speaking. That seven preceding editions, embodying language of the same tartness, have appeared without a single libel suit being brought into court, though many going companies are branded as swindles, is evidence that Mr. Stevens, notwithstanding the fact that he denounces several hundred companies as frauds, is sure of his ground in making such scathing arraignments as are contained in this and the past editions of his book. The price of the Copper Handbook is $5 and the publisher prepays carrying charges, allowing the purchaser a week's inspection.

The Durham Iron Co. properties at Riegelsville, Bucks Co., Pa., have been purchased by Wm. J. Fling, of Germantown, representing the bondholders, for $25,000. The purchase involves one small furnace.

Markets Show Fair Activity.

A moderate degree of activity as well as firmness distinguished the market last week. The average price advanced to the highest of the year, in some instances including Steel preferred reaching the highest price ever quoted. One successful high grade bond sale was that of $10,000,000 New York state canal 3 per cents at a premium.

Monday's opening was strong, but the close was weak and lower on a smaller volume of business; grain markets were less active and lower, and cotton advanced to the highest prices on the crop. A dull and irregular market Tuesday set off strength in the Steel stocks, and Wednesday's market showed moderate activity, even buoyancy, final prices being near the top. Although Thursday's opening was firm and higher, yet reaction set in in the afternoon and the close was lower. Less activity was noted in Friday's market, and although business was restricted by storms which interrupted private wires, the close was firm. Dullness was the feature of Saturday, combined with steadiness.

During the week the range of call money was broader than has been the rule recently, from 3 per cent to 1 per cent, the week's average being 1¾ per cent. Time money gradually became easier later in the week. There was no London market Saturday. Exports of gold for the week were $2,578,100, of which over $2,000,000 was shipped to Paris and $500,000 to Brazil. The winter wheat crop does not appear to be making desired progress. Bank clearings throughout the United States held practically the same volume as in the two weeks preceding, showing an increase over a year ago of 17 per cent, but compared with 1906 a decline of 13 per cent. Another heavy week of immigration was reported, the total arrivals for the week being 35,499. The statement of clearing house banks for the week shows that they held $11,207,200 more than the 25 per cent reserve requirements, this being an increase of $1,099,825. Loans decreased $2,228,000; deposits decreased $2,429,900, and the percentage of actual reserve was 25.60, a decrease of 0.2 per cent. Non-member banks and trust companies' loans increased $12,479,900; net deposits increased $2,951,700; the percentage of reserve was 19.1, an increase of 0.2. Shares were sold to the number of 3,641,749, compared with 4,823,600 the preceding week and 4,559,613 the corresponding week last year. Bonds, exclusive of government bonds, were sold to the amount of $31,605,000, compared with $40,506,000 the preceding week and $19,949,000 the corresponding week last year.

THE LEADING INDUSTRIAL SECURITIES.

	Closing Quo. May 1	Changes in Week	Date 1909 Ann.	M't'g.	Stock Outstanding	Dividend Basis	Dividend Last Declared	Dividend Date Last Div. Pay.
Allis-Chalmers	15½	— ⅜	Sept.	2	$19,820,000		.....	.....
Allis-Chalmers, pr	50	— ⅜			16,150,000	7 cum	1¾ Q.	Feb., 1904
American Can	10½	— ⅝	Feb.	2	41,233,300		.....	.....
American Can, pr	79	— ⅛			41,233,300	7 cum	1¾ Q.	Jan., 1909
Am. Car & Foundry	51⅛	+ ¾	June	24	30,000,000		½ Q.	Jan., 1909
Am. Car.& Fdy., pr	112½	+1			30,000,000	7 n. c.	1¾ Q.	Jan., 1909
American Loc	56¼	+ ⅞	Oct.	19	25,000,000	5	1¼ Q.	Aug., 1908
American Loc., pr	115	+ ⅞			25,000,000	7 cum	1¾ Q.	April, 1909
American Ship	54⅜	.....	Oct.	13	7,600,000	4	1 Q.	June, 1908
American Ship, pr	104½	.....			7,900,000	7 n. c.	1¾ Q.	Oct., 1908
Am. Steel Foundries(new)	37	— ½	Dec.	2	17,184,000		.....	.....
Am. Steel Foundries, pr	47½	.....			17,240,000	6 cum	1	Aug., 1904
Barney & Smith	36	.....	June	1	2,000,000	4	1 Q.	Sept., 1907
Barney & Smith, pr	95	.....			2,500,000	8 cum	2 Q.	June, 1908
Bethlehem Steel	23	— ½	April	6	14,862,000		.....	.....
Bethlehem Steel, pr	52	+2			14,908,000	7 n. c.	¾ Q.	Feb., 1907
Cambria Steel	37⅛	+ ¾	March	16	45,000,000*	3	1½ S. A.	Feb., 1909
Cambria Iron	46½	— ¼			8,468,000*	4	2 S. A.	Sept., 1908
Chicago Pneumatic Tool	22½	— ½	Feb.	15	6,145,800	4	1 Q.	Oct., 1907
Colorado Fuel	39	+ ¼	Oct.	18	34,235,500		3½	April, 1902
Crucible Steel	7⅜	— ⅛	Oct.	20	24,578,400		.....	.....
Crucible Steel, pr	60	.....			24,436,500	7 cum	1 Q.	Mar., 1909
Empire Steel	7	.....	April	27	1,254,770		.....	.....
Empire Steel, pr	47	.....			2,500,000	6 cum	1½ S. A.	Jan., 1909
Fay & Egan	90	.....	Feb.	18	1,000,000	7	1¾ Q.	Nov., 1908
Fay & Egan,pr	125	.....			1,000,000	7 cum	1¾ Q.	Nov., 1908
General Electric	159½	+ ¾	May	11	65,178,800	8	2 Q.	Jan., 1909
Harbison-Walker	17	.....	Jan.	18	18,000,000		½	Oct., 1907
Harbison-Walker, pr	80	.....			9,600,000	6 cum	1½ Q.	April, 1909
International Pump	39⅛	— ⅛	June	8	17,762,500		1	April, 1905
International Pump, pr	85½	— ⅛			11,350,000	6 cum	1½ Q.	May, 1909
Lackawanna Steel	32	.....	March	10	34,971,400		.....	.....
Lake Sup. Corp.	29	+1	Oct.	6	40,000,000		.....	.....
New York Air Brake	85	+ ¼	June	17	8,012,500	8	2 Q.	Oct., 1907
Niles-Bement-Pond	100	.....	Feb.	3	8,500,000	3	1½ Q.	Mar., 1909
Niles-Bement-Pond, pr	100	.....			2,000,000	6 cum	1½ Q.	Feb., 1909
Otis Elevator Co	50	+3	March	15	6,375,300		1½ S. A.	April, 1909
Otis Elevator Co., pr	96	.....			6,295,000	3 n. c.	1½ Q.	April, 1909
Penn Steel	50	.....	May	10	10,750,000		.....	.....
Penn. Steel, pr	104	—1			16,500,000	7 n. c.	3½ S. A.	May, 1909
Pittsburg Coal Co	10¾	— ⅜	March	9	28,104,600		.....	Nov., 1906
Pittsburg Coal Co., pr	43¾	.....			27,071,800	7 c.	1¾	April, 1905
Pressed Steel Car	39	+1	Feb.	17	12,500,000		3	Aug., 1904
Pressed Steel Car, pr	102	+2			12,500,000	7 n. c.	1¾ Q.	Feb., 1909
Pullman	185	.....	Nov.	10	100,000,000	8	2 Q.	May, 1909
Railway Stl. Spring	39½	— ¼	March	4	13,500,000	2	1 S. A.	Oct., 1908
Railway Stl. Spring, pr	99½	.....			13,500,000	7 cum	1¾ Q.	Dec., 1908
Rep. Iron & Steel	24⅝	+ ⅛	Oct.	20	27,191,000		.....	.....
Rep. Iron & Steel, pr	82½	+5			20,416,900	7 cum	1¾ Q.	April, 1908
Sloss-Sheffield	77½	+1½	March	10	10,000,000	5	1¼ Q.	Mar., 1909
Sloss-Sheffield, pr	112½	.....			6,700,000	7 n. c.	1¾ Q.	April, 1909
U. S. Pipe & Fdy	31¼	— ¾	June	23	12,500,000	2	½ Q.	Dec., 1907
U. S. Pipe & Fdy, pr	75	.....			12,500,000	7 n. c.	1¾ Q.	Sept., 1908
U. S. Steel	54¾	+1	April	19	508,302,500	2 n. c.	½ Q.	Mar., 1909
U. S. Steel, pr	115⅛	+ ⅛			360,281,100	7 cum	1¾ Q.	Mar., 1909
U. S. Steel, 5s	104	.....			463,798,000	5	5 A.	.....
Va. Iron, Coal & Coke	61	.....	Sept.	21	9,073,680		.....	.....
Westinghouse Elec	83¼	+1¼	June	16	27,173,200	10	2½ Q.	Oct., 1907
Westinghouse Air Brake	108	— ¼	Oct.	5	14,000,000*		2½ Q.	April, 1909

Par value of shares, $100, except those starred (*), $50.

Copper Stocks.

New York.—Amalgamated Copper closed 77½, a net gain of ⅜.

Boston.—Butte Coalition closed 24, a net loss of ¼; Calumet & Arizona closed 98½, a net loss of 1; Calumet & Hecla closed 605, no change; North Butte Mining closed 64¼, a net gain of 1; Quincy Mining closed 88, a net loss of ½.

Financial Notes.

The American Radiator Co. declared a dividend of 1¾ per cent on preferred stock, payable May 15, and on the common of 1½ per cent, payable June 30; the Pressed Steel Car Co. the quarterly dividend of 1¾ per cent on preferred, payable May 25; the Warwick Iron & Steel Co. the regular semi-annual dividend of 3 per cent, payable May 15; the International Harvester Co. the regular quarterly dividend of 1¾ per cent on preferred, payable June 1.

The plant of the Duncannon Iron Co., Duncannon, Perry Co., Pa., was offered for sale by the receivers April 22. One bid of $58,000 was received, but this was not entertained, as the court had placed the upset price at $63,000, subject to a mortgage of $37,000.

NEWS FROM MANY INDUSTRIES

New Buyers:—

The Mascot Stove Mfg. Co., Dalton, Ga., has been incorporated with $15,000 capital stock by D. C. Jones, P. B. Trammell and L. B. Greer.

The Litchfield Iron Works, Litchfield, Ill., capitalized at $12,000, has been incorporated by Alexander W. Crawford, Edmund Sweeney and William P. Crawford.

The Western Foundry Supply Co., East St. Louis, Ill., dealers in mineral and foundry supplies, capitalized at $500,000, has been incorporated by F. A. Terry, East St. Louis, Ill.

A charter has been granted to the Empire Motor Car Co., of Indianapolis, Ind., capitalized at $100,000. The directors are Carl G. Fisher, James A. Allison, Charles E. Test, A. C. Newby and Robert H. Hassler.

The Industrial Machine & Tipple Co., Knoxville, Tenn., mining machinery, has been chartered, with an authorized capital of $15,000, by Joseph Vasey, W. J. Everett, F. F. Floyd, and others.

J. J. Bigelow Co., New York City, manufacturing machinery, appliances and supplies, with $5,000 capital stock has been incorporated by Nancy M. Bigelow, Joseph B. McKeown and Joseph J. Bigelow, all of 170 West Broadway, New York City.

The Lackawanna Bridge Co., Buffalo, N. Y., enginering, contracting, bridge building, etc., has been chartered with $500,000 capital stock. The incorporators are Beverly L. Worden and Fordyce H. Bottum, both of Milwaukee, Wis., and Ralph A. Kellogg, Buffalo, N. Y.

The Garny-Mehserle Machine & Auto Co., Rochester, N. Y., has filed application for a charter to manufacture motors, engines, etc, with $2,000 capital stock. The incorporators are George and Theresa Garny, and Henry and Katherine Mehserle, all of Rochester.

The Automatic Sprinkler & Heating Equipment Co., New York City, manufacturing appliances for fire or water protection, fire or water alarm, or for heating purposes, has been incorporated with $50,000 capital stock, by William E. Randel, Frederick H. Van Houten and Peter B. Olney Jr., all of 678 William street, New York City.

The Brewster Mfg. Co., Brewster, N. Y., has filed application for a charter to manufacture wire with a capital of $100,000. Those interested are Theodore W. Blake, Brewster, N. Y.; Edwin K. Trowbridge, 114 East Thirty-eighth street; Theodore L. Frothingham, 32 Liberty street, both of New York City.

Articles of incorporation were filed by the Minneapolis Crucible Steel Co., Minneapolis, Minn., which has a capital stock of $100,000. The incorporators are E. L. Ford, F. E. Crary and Otto G. Rieske.

New Construction:—

The T. M. Nagle Engine & Boiler Co., Erie, Pa., is planning a machine shop 155 x 500 feet.

The Canton Enameling Co., Canton, O., is planning to erect a brick shop, 200 x 250 feet, estimated to cost $35,000.

The Jeffrey Mfg. Co., Columbus, O., is erecting a steel and brick stock building on the opposite side of its plant on First avenue.

The Speedwell Car Co., of Dayton, O., which recently increased its capital stock from $10,000 to $250,000, has purchased three acres of ground adjacent to its plant, and is planning an addition which will triple its capacity.

The Advance Machine Co., 194 South Clinton street, Chicago, has let contracts for a one-story shop of brick, mill construction, 55 x 100 feet, at an estimated cost of $5,000, to be built at 1346-52 East Ravenswood Park, Chicago.

The Glenn Mfg. Co., Aurora, Ill., is planning another department to be added to the plant, consisting of a nickel plating department for the purpose of nickel plating connections and other goods used in the general plumbing trade. The new department may not be added before next fall.

The Weinman Pump Mfg. Co., Columbus, O., recently received bids for the construction of a brick factory building to be located at the corner of City avenue and Spruce street, where it recently purchased a lot 135 x 135 feet. The building will be two stories in front and one story in the rear.

The Buffalo Copper & Brass Rolling Mill Co., Buffalo, N. Y., has let the contract for 175 tons of structural steel to the Buffalo Structural Steel Co., to be used in the erection of an addition to its plant at Military road and Arizona street. The addition will be 144 x 178 feet, with a corrugated steel roof.

The Olds Gas Power Co. has purchased the structural steel used in the Chicago World's Fair buildings to be used as the frame work for the new addition to be built to the Lansing, Mich., plant. It will be 48 x 390 feet, two stories high. The building will be of concrete, and will be used as additional space for a tool room and storage.

The Bridgeport Brass Co., Bridgeport, Conn., is planning additions to its plant, including a tube mill 100 x 360 feet, brick and steel with steel truss roof; and a boiler house 62 x 65 feet, one story, in which it will install seven boilers, with a combined capacity of 2,800 horsepower. It is estimated that the additions will cost $50,000.

The Michigan Brass & Iron Co., Lansing, Mich., which was recently reorganized with a capital stock of $20,000, has had plans drawn for a new foundry 50 x 130 feet, to be erected on the site of the old one at 213 Cedar street north. The officers of the new corporation are: President, William Walker; vice president and treasurer, Clifford K. Gleason; and secretary, Edward B. Prentice.

Col. E. A. Wall and Reuben May, proprietors of the Salt Lake Engineering Works, Salt Lake City, Utah, have announced that they will erect a steel castings foundry on a portion of the ground owned by the engineering works, estimated to cost about $50,000. Two buildings will be constructed and improved machinery installed. Besides steel castings of various descriptions, it is proposed to mold car wheels.

The Wyoming Foundry Co., Cheyenne, Wyo., which was recently organized by H. E. Stubbs, J. H. Thomas and S. Sparks, has combined with W. E. Deneen and will establish a machine and foundry business near Sixteenth and Eddy strets. This will give Cheyenne probably the largest machine and foundry shops in the state, with the exception of those maintained by the Union Pacific railroad there.

The Nye Tool & Machine Works, 11-17 South Jefferson street, Chicago, advises respecting its new construction recently noted, that it has added another floor to the factory in which it is operating. It has increased its capital stock from $25,000 to $50,000 in order to capitalize a portion of its surplus. It is now manufacturing a new line of threading tools, and already has orders for all that it can make in the next four months.

The Malleable Iron Range Co.,

Beaver Dam, Wis., has purchased from the city a lot upon which it will erect substantial additions. The wooden building occupied by the nickel and polishing departments will be replaced by one of mill construction, 60 x 168 feet, two stories, brick. The foundry will be located at Main and North Spring streets, L-shaped, 70 x 210 feet on one side, and 70 x 270 feet on the other, of brick construction with a steel span roof. It is the intention of the company to pour all its iron castings itself.

The Driggs-Seabury Ordnance Corporation, Sharon, Pa., advises respecting its new building that it is adding a lean-to to its drop forge and pressed steel department, which will be 22 x 560 feet. It will not install additional machinery, but is simply making room for present departments.

The Iowa Stove & Range Co., Waterloo, Ia., which was recently organized, has awarded the contract for the erection of a foundry on the site of the foundry owned by the Cascaden Co., to cost $7,800. The foundry will be 80 x 146 feet, and beside the modern machinery equipment, will contain shower baths and other conveniences for workmen.

The Virginia Bridge & Iron Co., Roanoke, Va., announces that it will establish a steel and bridge structural plant at Memphis, Tenn., at an estimated cost of $150,000. Work is to be begun at once, and the plant is to be complete Sept. 1. This is in addition to the plant which the company announced recently it is building at Atlanta, Ga.

The Peerless Motor Car Co., Cleveland, O., advises that additions to the Cleveland plant which are now under way include two three-story factory buildings, and extension of the present three-story building and a four-story office building which will give approximately 150,000 square feet of floor space. The factory building will be equipped with the latest machinery and the office building with all modern appliances. The company is also erecting at Broadway and Fifty-seventh street, New York city, a six-story garage and salesroom building for its exclusive use. J. Milton Dyer is the architect for the Cleveland building and Francis H. Kimball for the New York building.

The Perfection Spring Co., Cleveland, advises that the increase in its capital stock recently noted was for the purpose of erecting two additions to present buildings; one a tempering department, 70 x 100 feet, one story, mill construction, 22 feet high, with excellent provision for light and air. This department will be occupied within a week. The other addition will include a warehouse and forging department, 52 x 150 feet. Both buildings adjoin the present occupied structure, and when they are completed, the plant will have a capacity of five tons per day. The profits for the past year will be devoted to increasing equipment, both special and regular. The company manufactures automobile springs only, and has sufficient orders on hand to run the plant for six months, besides having contracts closed and in sight to occupy it for the the next 15 months.

The Globe Malleable Iron Co., Syracuse, N. Y., advises that it has begun upon an addition to its plant which will be of like construction with the present plant, namely, concrete, steel reinforced. The addition to the north end of the plant will be 100 x 125 feet, to be used as an annealing room, sorting and shipping rooms; the addition to the south end, 100 x 125 feet, to be used for molding space; addition to the east end of the foundry, 25 x 180 feet, to be used for match room, core room and experimental room. The company has purchased a Bury compressor from the Bury Compressor Co., motors from the General Electric Co., and is also in the market for some air hoist jib cranes, of one and two-ton capacity; an air hoist of two-ton capacity, and an electric overhead conveyor system. When the additions are completed, the building will cover about two acres of ground, and the company has about five acres of vacant land adjoining. A chemical laboratory has also been equipped to be used in the company's experimental department.

General Industrial:—

The Bates Machine Co., Joliet, Ill., has increased its capital stock from $100,000 to $400,000.

The Garrett Machine Works, Garrett, Ind., has increased its capital stock from $15,000 to $30,000.

The Western Foundry Supply Co., of New York city, has been authorized to operate in Illinois, with a state capital of $84,000.

The foundry of William Mann, recently deceased, at Martins Ferry, O., has been purchased by James H. Beans, former secretary and manager of the Centre Foundry & Machine Co., of Wheeling, W. Va.

Charles Tschudi has been appointed receiver of the Tschudi & McBarren Machine Co., Dayton, O. He was formerly president of the company, and will now take charge of the plant under direction of the court.

The Labatt Mfg. Co., 367 Queen street, West Toronto, Ont., manufacturer of plumbing supplies, has been bought out by the Standard Sanitary Mfg. Co., the Canadian branch of the Pittsburg house of the same name.

The Belle City Malleable & Wrought Iron Co., Lakeside, Wis., has installed a 14-ton steel punch and shear. The company just recently placed in operation an iron and steel magnet, which removes small particles of iron and steel from shop refuse.

The Akron Wire & Fence Co., Akron, O., which was organized with a capital stock of $15,000 a short while ago, was placed in the hands of a receiver April 27. The company's assets, including tools, office furniture, etc., amount to $4,700, and the liabilities to $4,400.

The East Liverpool Foundry & Machine Co., East Liverpool, O., has taken contracts for iron work for five kilns, one to go to Philadelphia, another to Carrollton, O., and three to Canonsburg, Pa. The plant is running full time, and the blacksmith department is behind on its orders.

The Interstate Engineering Co., Bedford, O., has received orders for 2,500 tons of structural steel, part of which will go into the construction of a building for the Goodrich Rubber Co., at Akron, the Northern Ohio Traction & Light Co., and the Enameled Pipe & Engineering Co., of Elyria. The company has just shipped a locomotive crane for government use in the Mare Island navy yard.

The Climax Railway Supply Co., 570 Old Colony building, Chicago, advises that its recent incorporation is simply a reorganization of the Climax Stock Guard Co., in order that it might take over representation in the west of several western manufacturers, in addition to its line of "clay" and expanded metal cattle guards, and steel farm cross gates which the company has been manufacturing for years.

Peter Gerlach & Co., Cleveland, have been awarded the contract for two carloads of stave heading and barrel machinery for a recently formed barrel manufacturing company of Mexico City, Mex. The Gerlach Co. reports that sales of machinery fell off only 2½ per cent in 1908 over those of 1907, and from present indications the sales of 1909 will exceed those of last year by fully 50 per cent.

W. N. Kratzer & Co., Pittsburg, structural steel and iron work, has received a contract for furnishing structural steel for the new Temple

theater being erected in Rochester, N. Y., aggregating about 600 tons, and included in this are two steel plate riveted box girders, each 22 inches wide, 53½ inches in depth and 84 feet in length, weighing 39 tons. Recently one of these girders was shipped from Pittsburg, and it was declared by the local newspapers as the heaviest load ever moved by teams over a Pittsburg street, 20 draft horses being employed to move the load.

Gulick, Henderson & Co., of Pittsburg, industrial chemists and engineers, have taken out articles of corporation in New Jersey under the title of Gulick-Henderson Co. Officers have been elected as follows: President, Henry Gulick; vice president, Ward O. Collins; treasurer, J. W. Henderson; secretary, W. P. Gulick. The business had formerly been conducted as a partnership and the incorporation involves no change in policy.

The last of the six new basic open-hearth furnaces which the National Tube Co. has just completed at its Lorain, O., plant was fired the past week and the steel is being supplied to the girder rail mill of the works. The Lorain plant has previously been equipped for making only Bessemer steel and in the event of open-hearth rails being specified, the blooms were shipped in by the Carnegie Steel Co. The new furnaces are of the most modern type and are of 80 tons capacity each.

The Trenton Engine Co., Trenton, N. J., which was recently organized by New York and Trenton capitalists, has purchased the plant of the Reeves Engine Co. In addition to high speed steam engines of the type perfected by Clifton Reeves, the Trenton company will make a feature of gas and gas producer engines for various sorts of marine purposes and also general use. The officers of the Trenton company are: President, William P. Cubberley; treasurer, A. K. Lueckel; secretary and general manager, E. W. Graef, who, together with Robert Kennedy and T. Van Kannell, are directors.

Trade Notes:—

The Independent Pneumatic Tool Co., Chicago, announces that May 1 it removed its general offices from the First National Bank building, Chicago, to its new "Thor" building at 1307 Michigan avenue, Chicago, where larger space and better facilities are provided for taking care of its steadily increasing business.

The Fred M. Prescott Steam Pump Co., Milwaukee, has announced that in order to facilitate supplying the increasing demand for its pumping engines, hydraulic machinery and condensing apparatus, it has opened a district sales office at Atlanta, Ga., which will be in charge of R. L. Radcliffe. All business originating in the southern and southeastern states will be handled directly from there.

The Ernst Wiener Co., New York City, builder of industrial cars and track, has appointed the W. K. Kenly Co., of Chicago, district sales agent for Chicago territory.

Fires:—

A gas explosion occurring in two core ovens of the Modern Foundry Co.'s plant, Cincinnati, April 24, caused damage to the amount of probably $500.

The frame portion of the machine shops of the Dean Mfg. Co., Seymour, Wis., was badly damaged April 16, the loss being placed at $7,000 with insurance of $6,000. Part of the machinery equipment was also injured.

Fire which started in the shops of the Worcester Metal Goods Co., Worcester, Mass., April 22, caused a loss of about $3,000. The H. G. Barrie Co., special machinery, sustained loss by water. All the losses are covered by insurance.

The roof, skylights, etc., of the foundry of the Hassel Iron Works, Colorado Springs, Colo., were burned April 17, causing a loss of $400.

TRADE PUBLICATIONS.

BERGER SYSTEM OF SIDEWALK AND VAULT LIGHTING.—The Berger Mfg. Co., Canton, O., is sending out a handsomely gotten up catalog of its "Raydiant" sidewalk and vault lights, which are used also for skylights, areaways, roofs, floors, etc., and contains within its 56 6 x 9-inch pages numerous illustrations of their application, covering buildings, etc., in all parts of the country.

GIROD ELECTRIC STEELS.—C. W. Leavitt & Co., 30 Church street, New York, are issuing a catalog describing various grades of steels for a variety of purposes, principally tool steels, but all manufactured by the electric furnace system of Paul Girod, at Ugine, France. Unusually high qualites are claimed for the steels made by this process.

SIROCCO BLOWERS.—The American Blower Co., Detroit, is distributing a booklet especially descriptive of its "Sirocco" fans, the manufacture of which, it will be remembered, they have recently undertaken. Examples of both engine and motor-driven fans applied to ventilation of buildings, ventilation and mechanical draft aboard ship and in stationary plants, mine ventilation, etc., are given, together with tables of dimensions and capacities.

STEEL SHEET PILING.—The Carnegie Steel Co., Pittsburg, in a 64-page, 10 x 8-inch catalog, illustrates and describes the different sizes and applications of the various forms of sections which they roll for sheet piling. Some of the information as to costs and repeated use of steel sheet piling will be found very interesting. The catalog is one of the handsomest specimens of the kind that has come under our notice.

MACHINERY AND SMALL TOOLS.—The Brown & Sharpe Mfg. Co., Providence, R. I., has issued its 1909 catalog of 500 3½ x 6-inch pages, describing its line of machine and small tools, covering milling machines, both horizontal and vertical, a full line of attachments, plain, universal and tool-grinding machines and attachments, gear-cutting machines, screw machines, turret-forming and cutting-off machines, horizontal and vertical chucking machines, tool furnaces and a full line of gear cutters, reamers and machinists' small tools, including a very complete list of measuring instruments.

REVOLVING ELEVATORS.—The New York Revolving Portable Elevator Co., Jersey City, N. J., in a 24-page, 6 x 9-inch catalog, describes its portable revolving elevators intended for use in factories, warehouses and other places where boxes, barrels, cases, etc., are handled. The apparatus consists of a vertical frame with a projecting foot or table at the base and the whole mounted on a three-wheel truck. The load to be moved can be rolled or otherwise placed on the table and elevated to the desired height and the whole revolved on the circular base, allowing the load to be transferred to the top of a stockpile, or on to a truck or shelf, or elsewhere. They are built in capacities up to 1,200 pounds, and up to a hoist of 10 feet.

ELECTRIC FURNACES.—At the present time, when the electric furnace is attracting so much attention for the treating and smelting of ores and the refining of metals, the catalog on the above subject issued by the American Electric Furnace Co., New York, and describing the Kjellin, Colby and Rochling-Rodenhauser types of furnaces, will doubtless be found valuable. Tables are included, giving the types and sizes of furnaces built, with the production, capacity and the power required, and also half-tones of samples of work produced.

COAL AND ORE-HANDLING MACHINERY.—The C. W. Hunt Co., New York, in its catalog No. 091, 88 pages, 6½ x 9 inches, describes lines of hoisting and conveying apparatus built by it and applicable to various situations, duties and capacities. Numerous illustrations of typical installations are included.

VENTILATING AND GAS-BLOWING APPARATUS.—The B. F. Sturtevant Co., Hyde Park, Mass., in bulletin 105, describes its gas boosters and exhausters, and in bulletin 106 a very decided and interesting novelty in the shape of a portable electric ventilating set, which is designed to take current from the ordinary lighting circuit in a house and can be carried about from room to room. By means of a length of flexible canvas hose attached to the outlet, it can be made to thoroughly ventilate any apartment. The largest size is only about 12 inches high and weighs about 50 pounds, and, it is claimed, will use less than three cents' worth of current per hour, the smallest about one cent's worth. It is also claimed that a moderate sized room can be thoroughly ventilated in 10 or 15 minutes. Doubtless this type of apparatus will soon take rank with the ordinary electric fan.

STEAM SHOVELS, LOCOMOTIVE CRANES, ETC.—The Browning Engineering Co., Cleveland, in its bulletins Nos. 31, 33, 34, 35 and 37, describes a line of lifting magnets, steam shovels, automatic buckets, locomotive cranes and scraper bucket excavators, with illustrations and descriptions of their application to various services.

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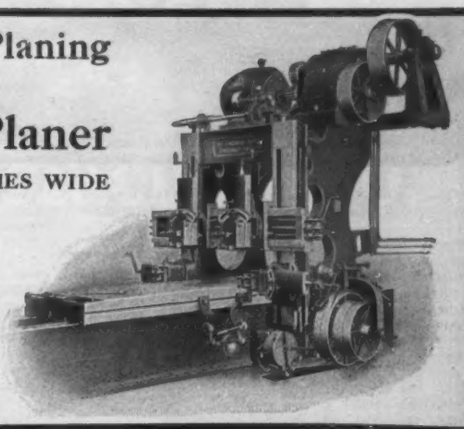

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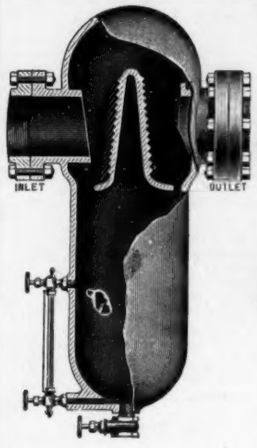

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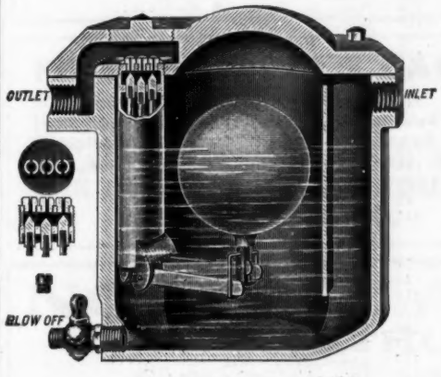

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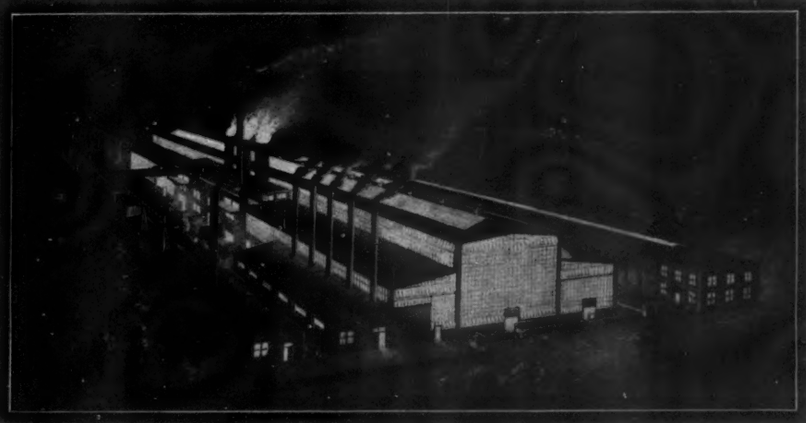

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BARS (Iron and Steel)—Continued.

Inland Steel Co., Chicago, Ill.
Interstate Iron & Steel Co., Chicago, Ill.
Jones & Laughlin Steel Co., Pittsburg, Pa.
Kratzer, W. N., & Co., Pittsburg, Pa.
LaBelle Iron Works, Steubenville, O.
Lackawanna Steel Co., New York City.
Lockhart Iron & Steel Co., Pittsburg, Pa.
Milton Mfg. Co., Milton, Pa.
North Works, Chicago, Ill.
Republic Iron & Steel Co., Pittsburg, Pa.
Ryerson, Jos. T., & Son, Chicago, Ill.
Scully Steel & Iron Co., Chicago, Ill.
Standard Gauge Steel Co., Beaver Falls, Pa.
Tennessee Coal, Iron & Railroad Co., Birmingham, Ala.

BARS (Sheet).

Carnegie Steel Co., Pittsburg, Pa.
Lackawanna Steel Co., New York City.
LaBelle Iron Works, Steubenville, O.
Mudge, Edmund W., & Co., Pittsburg, Pa.
Republic Iron & Steel Co., Pittsburg, Pa.
Tennessee Coal, Iron & Railroad Co., Pittsburg, Pa.
United Steel Co., Canton, O.
Youngstown Sheet & Tube Co., Youngstown, O.

BARS (Splice).

Carnegie Steel Co., Pittsburg, Pa.
Central Track Supply Co., Springfield, O.
Lackawanna Steel Co., New York City.

BATTERIES (Storage).

Westinghouse Machine Co., E. Pittsburg, Pa.

BEARINGS.

Auburn Ball Bearing Co., Rochester, N. Y.
Enterprise Metal Co., Syracuse, N. Y.
Jones & Laughlin Steel Co., Pittsburg, Pa.
Phosphor Bronze Smelting Co., Philadelphia, Pa.
Ryerson, Jos. T., & Son, Chicago, Ill.
Schultz, A. L., & Son, Chicago, Ill.

BELLOWS (Foundry).

Obermayer, S., Co., Cincinnati, O.
Smith, J. D., Fdry. Supply Co., Cleveland, O.

BELTING.

Chicago Rawhide Mfg. Co., Chicago, Ill.

BELTING (Link).

Dodge Mfg Co., Mishawaka, Ind.
Jeffrey Mfg. Co., Columbus, O.
Ohio Malleable Iron Co., Columbus, O.
Port Huron Engine & Thresher Co., Port Huron, Mich.

BELTS (Conveying).

Jeffrey Mfg. Co., Columbus, O.

BENCHES (Draw, Wire, Rivet and Bolt Works).

Morgan Construction Co., Worcester, Mass.
Turner, Vaughn & Taylor Co., Cuyahoga Falls, O.
Waterbury Farrel Foundry & Machine Co., Waterbury, Conn.

BILLETS.

American Steel & Wire Co., Chicago, Ill.
Bassett, Presley Co., Cleveland, O.
Carnegie Steel Co., Pittsburg, Pa.
Inland Steel Co., Chicago, Ill.
Jones & Laughlin Steel Co., Pittsburg, Pa.
LaBelle Iron Works, Steubenville, O.
Lackawanna Steel Co., New York City.
North Works, Chicago, Ill.
Otis Steel Co, Cleveland, O.
Republic Iron & Steel Co., Pittsburg, Pa.
Stewart Iron Co., Ltd., Cleveland, O.
Taylor, N. & G., Co., Philadelphia, Pa.
Tennessee Coal, Iron & Railroad Co., Pittsburg, Pa.
United Steel Co., Canton, O.
Wood, Alan, Iron & Steel Co., Philadelphia, Pa.

BINS (Ore, Coal, Storage, Etc.).

Canton Boiler & Engineering Co., Canton, O.

BLOCKS (Chain).

Byers, John F., Machine Co., Ravenna, O.
Chisholm & Moore Mfg. Co., Cleveland, O.

BLOCKS (Cupola).

American Refractories Co., Chicago, Ill.
Harbison-Walker Refractories Co., Pittsburg, Pa.
Obermayer, S., Co., Cincinnati, O.
Smith, J. D., Fdry. Supply Co. Cleveland, O.
Stevens, F. B., Detroit, Mich.
Stowe-Fuller Co., Cleveland, O.

BLOOMS.

Carnegie Steel Co., Pittsburg, Pa.
Hillman, J. H., & Son, Pittsburg, Pa.
Inland Steel Co., Chicago, Ill.
Jones & Laughlin Steel Co., Chicago, Ill.
LaBelle Iron Works, Steubenville, O.
Lackawanna Steel Co., New York City.
National Tube Co., Pittsburg, Pa.
Tennessee Coal, Iron & Railroad Co., Pittsburg, Pa.
Wood, Alan, Iron & Steel Co., Philadelphia.

BLOWERS.

Cameron, A. S., Steam Pump Works, New York City.
Eynon-Evans Mfg. Co., Philadelphia, Pa.
General Electric Co., Schenectady, N. Y.
Green Fuel Economizer Co., Matteawan, N. Y.
Smith, J. D., Fdry, Supply Co., Cleveland, O.

BOILERS.

Baird Machinery Co., Pittsburg, Pa.
Canton Boiler & Engrg. Co., Canton, O.
Chicago House Wrecking Co., Chicago, Ill.
Cooper, C. & G., Co., Mt. Vernon, O.
Farrar & Trefts, Buffalo, N. Y.
Hathaway, A. G., & Co., Cleveland, O.
Industrial Works, Bay City, Mich.
Lake Erie Engine Works, Buffalo, N. Y.
Meehan Boiler & Construction Co., Lowellville, O.
Petroleum Iron Works Co., Sharon, Pa.
Phoenix Iron Works Co., Meadville, Pa.
Randle Machinery Co., Cincinnati, O.
Riter-Conley Mfg. Co., Pittsburg, Pa.
Schultz, A. L., & Son, Chicago, Ill.
Sharon Boiler Works, Sharon, Pa.
Standard Boiler & Plate Iron Co., Niles, O.
Struthers-Wells Co., Warren, Pa.
Toomey, Frank, Philadelphia, Pa.
Vandyck-Churchill Co., New York City.
Wickes Bros., Pittsburg, Pa.

BOLTS.

American Bridge Co., New York City.
Bassett-Presley Co., Cleveland, O.
Chicago Screw Co., Chicago, Ill.
Graham Nut Co., Pittsburg, Pa.
Jones & Laughlin Steel Co., Pittsburg, Pa.
Milton Mfg. Co., Milton, Pa.
National Bolt & Nut Co., Pittsburg, Pa.
Oliver Iron & Steel Co., Pittsburg, Pa.
Republic Iron & Steel Co., Pittsburg, Pa.
Russell, Burdsall & Ward Bolt & Nut Co., Port Chester, N. Y.
Ryerson, Joseph T., & Son, Chicago, Ill.
Steel Car Forge Co., Pittsburg, Pa.
Upson Nut Co., Cleveland, O.

BOOKS.

Penton Publishing Co., Cleveland, O.

BOXES (Annealing).

Canton Boiler & Engrg. Co., Canton, O.
Meehan Boiler & Construction Co., Lowellville, O.
Union Steel Casting Co., Pittsburg, Pa.
United Engineering & Fdy. Co., Pittsburg, Pa.
Wilfong Bros., Philadelphia, Pa.

BOXES (Charging).

Meehan Boiler & Construction Co., Lowellville, O.
Morgan Engineering Co., Alliance, O.
Variety Iron & Steel Works Co., Cleveland, O.

BRACES (Rail).

Central Track Supply Co., Springfield.

BRAZING (Custom).

Champion Engineering Co., Cleveland, O.

BREAKERS (Casting).

Curtis & Co. Mfg. Co., St. Louis, Mo.
Whiting Foundry Equipment Co., Harvey, Ill.

BREAKERS (Circuit).

General Electric Co., Schenectady, N. Y.
Westinghouse Electric & Mfg. Co., Pittsburg, Pa.

BRICK AND CLAY (Fire).

American Refractories Co., Joliet, Ill.
Ashland Fire Brick Co., Ashland, Ky.
Bickford Fire Brick Co., Pittsburg, Pa.
Blackwell, Geo. G., Sons & Co., Liverpool.
Clearfield Fire Brick Co., Clearfield, Pa.
Dover Fire Brick Co., Cleveland, O.
Harbison-Walker Refractories Co., Pittsburg, Pa.
Kenworthy Engineering Co., Waterbury, Conn.
Niles Fire Brick Co., Niles, O.
Scioto Fire Brick Co., Sciotoville, O.
Stowe-Fuller Co., Cleveland, O.
Smith, J. D., Fdry. Supply Co., Cleveland, O.
Soisson, Jos., Fire Brick Co., Connellsville, Pa.
Stevens, F. B., Detroit, Mich.
Swank's Sons, Hiram, Johnstown, Pa.

BRICK (Silica, Magnesia, Chrome).

American Refractories Co., Joliet, Ill.
Harbison-Walker Refractories Co., Pittsburg, Pa.
Soisson, Jos., Fire Brick Co., Connellsville, Pa.
Stowe-Fuller Co., Cleveland, O.

BRIDGES AND VIADUCTS (Steel).

American Bridge Co., New York City.
Bellefontaine Bridge & Steel Co., Bellefontaine, O.
Interstate Engineering Co., Cleveland, O.
McClintic-Marshall Construction Co., Pittsburg, Pa.

BRUSHES (Foundry).

Obermayer, S., Co., Cincinnati, O.
Smith, J. D., Fdry. Supply Co., Cleveland, O.

BUCKETS (Clam Shell).

Interstate Engineering Co., Bedford, O.
Macbeth Iron Co., Cleveland, O.
McMyler Mfg. Co., Cleveland, O.
Wellman-Seaver-Morgan Co., Cleveland, O.

BUCKETS (Elevator and Hoisting).

Bartlett, C. O., & Snow Co., Cleveland, O.
Brown Hoisting Machinery Co., Cleveland, O.
Jeffrey Mfg. Co., Columbus, O.
McMyler Mfg. Co., Cleveland, O.
Ohio Malleable Iron Co., Columbus, O.
Wellman-Seaver-Morgan Co., Cleveland, O.

BULLDOZERS.

Cleveland Punch & Shear Works Co., Cleveland, O.
Long & Allstatter Co., Hamilton, O.
National Machinery Co., Tiffin, O.

BULLDOZERS (Hydraulic).

Chambersburg Engineering Co., Chambersburg, Pa.

BURNERS (Fuel Oil).

Burns Oil-Fuel Furnace Co., Fort Plain, N. Y.
Petroleum Iron Works Co., Sharon, Pa.
Rockwell Furnace Co., New York, N. Y.

BURRS (Rivet).

Wrought Washer Mfg. Co., Milwaukee, Wis.

CABLEWAYS.

McClintic-Marshall Construction Co., Pittsburg, Pa.

CARS (Annealing, Pig Iron, Etc).

Chase Foundry & Mfg. Co., Columbus, O.
Smith, J. D., Fdry, Supply Co., Cleveland, O.
Whiting Foundry Equipment Co., Harvey, Ill.
Youngstown Car Mfg. Co., Youngstown, O.

CARS (Billet).

Atlas Car & Mfg. Co., Cleveland, O.
Chase Foundry & Mfg. Co., Columbus, O.
Watt Mining Car Wheel Co., Barnesville, O.
Youngstown Car Mfg. Co., Youngstown, O.

CARS (Charging).

Atlas Car & Mfg. Co., Cleveland, O.
Chase Foundry & Mfg. Co., Columbus, O.
Variety Iron & Steel Works Co., Cleveland, O.
Youngstown Car Mfg. Co., Youngstown, O.

CARS (Coal, Coke and Mining).

Jeffrey Mfg. Co., Columbus, O.
Massillon Fdry. & Machine Co., Massillon, O.
Watt Mining Car Wheel Co., Barnesville, O.
Wiener Co., Ernst, New York, N. Y.
Youngstown Car Mfg. Co., Youngstown, O.

CARS (Derrick).

Byers, John F., Machine Co., Ravenna, O.
Watt Mining Car Wheel Co., Barnesville, O.

CARS (Electrically Driven).

Atlas Car & Mfg. Co., Cleveland, O.
Jeffrey Mfg. Co., Columbus, O.
Westinghouse Machine Co., E. Pittsburg, Pa.

CARS (Industrial).

Atlas Car & Mfg. Co., Cleveland, O.
Chase Foundry & Mfg. Co., Columbus, O.
Watt Mining Car Wheel Co., Barnesville, O.
Wiener Co., Ernst, New York, N. Y.
Whiting Foundry Equipment Co., Harvey, Ill.
Youngstown Car Mfg. Co., Youngstown, O.

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Canton Boiler & Engrg. Co., Canton, O.
Meehan Boiler & Construction Co., Lowellville, O.
Standard Boiler & Plate Iron Co., Niles, O.

CASTINGS (Auto).

Acme Steel & Malleable Iron Works, Buffalo, N. Y.
Canton Brass Co., Canton, O.
Chisholm & Moore Mfg. Co., Cleveland, O.
Ideal Bronze Co., Cleveland, O.
Ohio Malleable Iron Co., Columbus, O.

CASTINGS (Brass, Bronze and Aluminum).

Canton Brass Co., Canton, O.
Dake Engine Co., Grand Haven, Mich.
Eynon-Evans Mfg. Co., Philadelphia, Pa.
Farrar & Trefts, Buffalo, N. Y.
Ideal Bronze Co., Cleveland, O.
Mesta Machine Co., Pittsburg, Pa.
Pittsburg Valve Foundry & Construction Co., Pittsburg, Pa.
Powell, Wm., Co., Cincinnati, O.
United Engineering & Foundry Co., Pittsburg, Pa.

CASTINGS (Crucible Steel).

Chicago Steel Foundry Co., Chicago, Ill.
Oostburg Steel Foundry, Oostburg, Wis.
Prime Steel Co., Milwaukee, Wis.
Strong Steel Foundry Co., Buffalo, N. Y.

CASTINGS (Die).

Strong Steel Foundry Co., Buffalo, N. Y.
United Engineering & Fdy. Co., Pittsburg, Pa.

CASTINGS (Galvanized).

Cleveland Galvanizing Works Co., Cleveland, O.

CASTINGS (Gray Iron).

American Bridge Co., New York City.
American Roll & Foundry Co., Canton, O.
Barlow Foundry Co., Newark, N. J.
Birdsboro Steel Foundry & Machine Co., Birdsboro, Pa.
Birmingham Iron Foundry, Derby, Conn.
Buffalo Foundry & Machine Co., Buffalo, N. Y.
Chambersburg Engineering Co., Chambersburg, Pa.
Cleveland Punch & Shear Works Co., Cleveland, O.
Curtis & Co. Mfg. Co., St. Louis, Mo.
Dake Engine Co., Grand Haven, Mich.
East Buffalo Iron Works, Buffalo, N. Y.
Farrar & Trefts, Buffalo, N. Y.
Farrel Fdry. & Machine Co., Ansonia, Conn.
Flagg, Stanley G., & Co., Philadelphia, Pa.
Green Engineering Co., Chicago, Ill.
Lake Erie Engineering Works, Buffalo, N. Y.
Macbeth Iron Co., Cleveland, O.
Marshall Foundry Co., Pittsburg, Pa.
Massillon Fdry. & Mach. Co., Massillon, O.
Mesta Machine Co., Pittsburg, Pa.
National Foundry Co., Erie, Pa.
Phoenix Iron Works Co., Meadville, Pa.
Ross-Meehan Foundry Co., Chattanooga, Tenn.
Shelby Foundry Co., Shelby, O.
Standard Engineering Co., Ellwood City, Pa.
Taylor-Wilson Mfg. Co., McKees Rocks, Pa.
Taylor & Boggis Foundry Co., Cleveland, O.
Union Foundry & Machine Co., Pittsburg, Pa.
United Engineering & Foundry Co., Pittsburg, Pa.
United States Cast Iron Pipe & Foundry Co., New York City.
Wheeling Mold & Fdy. Co., Wheeling, W. Va.
Youngstown Car Mfg. Co., Youngstown, O.
Youngstown Fdy. & Mach. Co., Youngstown, O.

CASTINGS (Gray Iron, Car and Locomotive).

Buffalo Fdy. & Mach. Co., Buffalo, N. Y.
East Buffalo Iron Works, Buffalo, N. Y.
Farrar & Trefts, Buffalo, N. Y.
Lake Erie Engineering Works, Buffalo, N. Y.
National Foundry Co., Erie, Pa.
Phoenix Iron Works Co., Meadville, Pa.
Ross-Meehan Foundry Co., Chattanooga, Tenn.
Taylor-Wilson Mfg. Co., McKees Rocks, Pa.
United Engineering & Fdy. Co., Pittsburg, Pa.
Wheeling Mold & Fdy. Co., Wheeling, W. Va.

CASTINGS (Gray Iron Machinery).

Taylor & Boggis Foundry Co., Cleveland, O.
Wheeling Mold & Fdy. Co., Wheeling, W. V.

CASTINGS (Light Gray Iron).

Taylor & Boggis Foundry Co., Cleveland, O.

CASTINGS (Malleable).

Acme Steel & Malleable Iron Works, Buffalo, N. Y.
Barlow Foundry Co., Newark, N. J.
Chisholm & Moore Mfg. Co., Cleveland, O.
Columbus Malleable Casting Co., Columbus, O.
Dayton Malleable Iron Co., Dayton, O.
Erie Malleable Iron Co., Erie, Pa.
Flagg, Stanley G., & Co., Philadelphia, Pa.
Galesburg Mall. Castings Co., Galesburg, Ill.
Grand Rapids Malleable Works, Grand Rapids, Mich.
Jeffrey Mfg. Co., Columbus, O.
Lakeside Malleable Castings Co., Racine, Wis.
Missouri Malleable Iron Co., E. St. Louis, Ill.
Northwestern Malleable Iron Co., Milwaukee, Wis.
Ohio Malleable Iron Co., Columbus, O.
Port Huron Engine & Thresher Co., Port Huron, Mich.
Pratt & Letchworth Co., Buffalo, N. Y.
Ross-Meehan Foundry Co., Chattanooga, Tenn.
Standard Malleable Iron Co., Muskegon, Mich.
Union Malleable Iron Co., East Moline, Ill.
West Virginia Malleable Iron Co., Point Pleasant, W. Va.
Wisconsin Malleable Iron Co., Milwaukee, Wis.

CASTINGS (Malleable, Car and Locomotive).

Acme Steel & Malleable Iron Works, Buffalo, N. Y.
Dayton Malleable Iron Co., Dayton, O.
Jeffrey Mfg. Co., Columbus, O.
Lakeside Malleable Castings Co., Racine, Wis.
Missouri Malleable Iron Co., E. St. Louis, Mo.
Northwestern Mall. Iron Co., Milwaukee, Wis.
Ohio Malleable Iron Co., Columbus, O.
Port Huron Engine & Thresher Co., Port Huron, Mich.
Pratt & Letchworth Co., Buffalo, N. Y.
Ross-Meehan Foundry Co., Chattanooga, Tenn.
Union Malleable Iron Co., East Moline, Ill.

CASTINGS (Semi-Steel).

Birmingham Iron Foundry, Derby, Conn.
Flagg, Stanley G., & Co., Philadelphia, Pa.
Lake Erie Engineering Works, Buffalo, N. Y.
Mesta Machine Co., Pittsburg, Pa.
Taylor-Wilson Mfg. Co., McKees Rocks, Pa.
United Engineering & Fdy. Co., Pittsburg, Pa.

CASTINGS (Steel).

Acme Steel & Malleable Iron Works, Buffalo, N. Y.
Birdsboro Steel Foundry & Machine Co., Birdsboro, Pa.
Bucyrus Steel Casting Co., Bucyrus, O.
Curtis & Co. Mfg. Co., St. Louis, Mo.
Evans, David, & Co., Chicago, Ill.
Flagg, Stanley G., & Co., Philadelphia, Pa.
Massachusetts Steel Casting Co., Everett, Mass.
Mesta Machine Co., Pittsburg, Pa.
National Foundry Co., Erie, Pa.
Oostburg Steel Foundry, Oostburg, Wis.
Otis Steel Co., Cleveland, O.
Pratt & Letchworth Co., Buffalo, N. Y.
Prime Steel Co., Milwaukee, Wis.
Riverside Steel Casting Co., Newark, N. J.
Sharon Foundry Co., Sharon, Pa.
Solid Steel Casting Co., Chester, Pa.
Strong Steel Foundry Co., Buffalo, N. Y.
United Engineering & Fdy. Co., Pittsburg, Pa.
Union Steel Casting Co., Pittsburg, Pa.
Wellman-Seaver-Morgan Co., Cleveland, O.
West Steel & Iron Casting Co., Cleveland, O.
Youngstown Fdy. & Mach Co., Youngstown, O.

CASTINGS (Steel, Electrical).

Strong Steel Foundry Co., Buffalo, N. Y.
West Steel & Iron Casting Co., Cleveland, O.

CASTINGS (Steel, Car and Locomotive).

Acme Steel & Malleable Iron Works, Buffalo, N. Y.
Bucyrus Steel Casting Co., Bucyrus, O.
Mesta Machine Co., Pittsburg, Pa.
National Foundry Co., Erie, Pa.
Otis Steel Co., Cleveland, O.
Prime Steel Co., Milwaukee, Wis.
Pratt & Letchworth Co., Buffalo, N. Y.
Riverside Steel Casting Co., Newark, N. J.
Strong Steel Foundry Co., Buffalo, N. Y.
Union Steel Casting Co., Pittsburg, Pa.
United Engineering & Fdy. Co., Pittsburg, Pa.
Wellman-Seaver-Morgan Co., Cleveland, O.
West Steel & Iron Casting Co., Cleveland, O.

CASTINGS (Stove Plate).

Taylor & Boggis Foundry Co., Cleveland, O.

CASTINGS (Vanadium).

Mesta Machine Co., Pittsburg, Pa.
Strong Steel Foundry Co., Buffalo, N. Y.
Union Steel Casting Co., Pittsburg, Pa.
United Engineering & Fdy. Co., Pittsburg, Pa.

CEMENT.

American Refractories Co., Chicago, Ill.
Universal Portland Cement Co., Chicago, Ill.

CHAINS.

Bassett-Presley Co., Cleveland, O.
Jones & Laughlin Steel Co., Pittsburg, Pa.
Morse Chain Co., Ithaca, N. Y.
Steel Car Forge Co., Pittsburg, Pa.

CHAPLETS.

Obermayer, S., Co., Cincinnati, O.
Smith, J. D., Fdry. Supply Co., Cleveland, O.

CHARCOAL.

Hillman, J. H., & Son, Pittsburg, Pa.
Obermayer, S., Co., Cincinnati, O.
Smith, J. D., Fdry. Supply Co., Cleveland, O.

CHEMISTS (Analytical).

Emmerton, F. A., Cleveland, O.
Peck, Francis J., & Co., Cleveland, O.

CHISELS (Cold).

Anderson Forge & Machine Co., Detroit, Mich.

CLUTCHES.

Brown Hoisting Machinery Co., Cleveland, O.
Dodge Mfg. Co., Mishawaka, Ind.
Farrar & Trefts, Buffalo, N. Y.
Farrel Fdry. & Machine Co., Ansonia, Conn.
Schultz, A. L., & Son, Chicago, Ill.

CLUTCHES (Induction).

Wheeling Mold & Fdy. Co., Wheeling, W. Va.

COAL AND COKE.

Baird & West, Detroit, Mich.
Bessemer Coke Co., Pittsburg, Pa.
Blair, Reed F., & Co., Pittsburg, Pa.
Bourne-Fuller Co., Cleveland, O.
Columbus Iron & Steel Co., Columbus, O.
DeCamp Bros. & Yule Iron, Coal & Coke Co., St. Louis, Mo.
Eaton, Rhodes & Co., Cincinnati, O.
Debevoise-Anderson Co., New York City.
Hammond-Byrd Co., Birmingham, Ala.
Hanna, M. A., & Co., Cleveland, O.
Hickman, Williams & Co., Chicago, Ill.
Hillman, J. H., & Son, Pittsburg, Pa.
Jamison Coal & Coke Co., Pittsburg, Pa.
La Belle Iron Works Co., Steubenville, O.
McKeefrey & Co., Leetonia, O.
Mohr, J. J., & Son, Philadelphia, Pa.
Mudge & Co., Edmund W., Pittsburg, Pa.
Rogers, Brown & Co., Cincinnati, O.
Shanklin, Jas. R., & Co., Cincinnati, O.
Stewart Iron Co., Ltd., Cleveland, O.
Tennessee Coal, Iron & Railroad Co., Pittsburg, Pa.
Walter-Wallingford & Co., Cincinnati, O.
Washington Coal & Coke Co., Pittsburg, Pa.

COCKS (Gage).

Chanlin Fulton Mfg. Co., Pittsburg, Pa.
Jenkins Bros., New York City.
Wright Mfg. Co., Detroit, Mich.

COILS (Pipe).

Green Fuel Economizer Co., Matteawan, N. Y.
Pittsburg Valve Foundry & Construction Co., Pittsburg, Pa.

COLUMNS (Water).

Wright Mfg. Co., Detroit, Mich.

COLUMN (Water Alarm).

Wright Mfg. Co., Detroit, Mich.

COMPOUND (Core).

Obermayer, S., Co., Cincinnati, O.
Smith, J. D., Fdry. Supply Co., Cleveland, O.

COMPRESSORS (Air).

American Air Compressor Works, New York City.
American Compressor & Pump Co., New York.
Baird Machinery Co., Pittsburg, Pa.
Cameron, A. S., Steam Pump Works, New York City.
Curtis & Co. Mfg. Co., St. Louis, Mo.
Dean Bros. Steam Pump Works, Indianapolis, Ind.
Deming Bros., Salem, O.
Eynon-Evans Mfg. Co., Philadelphia, Pa.
General Electric Co., Schenectady, N. Y.
Independent Pneumatic Tool Co., Chicago, Ill.
McGowan, John H., Co., Cincinnati, O.
Mesta Machine Co., Pittsburg, Pa.
Norwalk Iron Works Co., So. Norwalk, Conn.
Scully Steel & Iron Co., Chicago, Ill.
Shepard Electric Crane & Hoist Co., Montour Falls, N. Y.
Wickes Bros., Pittsburg.
Wisconsin Engine Co., Corliss, Wis.